THE FOUNDRY

Volume 53
Number 4

CLEVELAND, OHIO, FEBRUARY 15, 1925

Published
Semimonthly

Castings Aid in Protecting Motorist and Pedestrian

TRAFFIC regulation is one of the weighty problems now confronting municipalities. Metropolitan centers and cross road villages alike are forced to formulate traffic regulations. Castings have a place in many schemes, the uses ranging from the artistic bronze towers in New York, each of which contain 36 separate castings with a combined weight

Art and Utility Are Combined in New York's Traffic Towers

of 6000 pounds, to the iron bases for keep-to-the-right, no parking, semaphore and safety zone stanchions. Castings also are used for automatic semaphores, and small traffic domes. New York has in service 460 bases weighing from 60 to 75 pounds each, totaling 32,200 pounds, and 1800 weighing 28 pounds each, totaling 50,400 pounds, the total being 82,600 pounds. Cleveland uses 24,000 pounds of iron in 600 bases averaging 40 pounds each and 12,100 pounds in 110 semaphore bases weighing 110 pounds each, or a total of 36,000 pounds.

Find Where Castings Can Be Sold

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He Turneth the Forbidding Front To FOUNDRY-MEN

But to the Boss He Shineth With Many Good DEEDS

How Does the P. A. Get That Way?

By A Victim

PROBABLY there are two sides to the question. Usually two sides may be found to any question if the seeker after knowledge is disinterested, but the average foundryman is satisfied there is only one side to the perennial dispute between himself and the purchasing agent who buys his castings.

If the purchasing agent is right *he* is discreetly silent on the subject. The foundryman is willing, nay anxious to lay his grievance before anyone, regardless of whether that person wants to listen or not. In fact, the foundryman is inclined to view the negative character of the purchasing agent's defense as a direct admission of weakness if not actual fault.

Foundrymen are willing to admit that a purchasing agent occasionally may act in a manner that almost is human, but as a rule they regard the tribe as a necessary evil, and one that is not so necessary perhaps that the industrial world could not wag along just as readily without it. Indiscriminate statements, of course must be taken with a grain or two of salt and it may be that a closer investigation of the subject will show a condition that exists to a greater or less extent in every trade and profession. The entire body gains an unsavory reputation through the action of a few.

A stickler for accuracy might claim that purchasing is neither a trade nor a profession and here again opinions probably will differ. The man sitting behind a purchasing agent's desk considers it is an art. Those who have to do business from the other side of the desk frequently refer to it by other terms that by no stretch of the imagination could be construed as flattering. Existing relations between foundrymen and purchasing agents are the result of a slow growth and are due to many contributory factors. The most important is the almost universal human attribute of shopping around for bargains. In some men this attribute becomes a positive mania, in others it becomes a hobby at which they become adepts and in a third class it is based on purely personal mercenary motives. Often, an appropriation is made for the purchase of castings at a definite price and the purchasing agent is given a certain percentage, ranging from 10 to 50 per cent of all he saves out of this amount, by securing castings at a lower figure.

Habits Hard to Change

Habit, custom and tradition play their part in maintaining present conditions. At one time the foundryman had only a hazy notion of production costs. In a general way he knew his total cost for a year and his total tonnage for the same period and that supplied him with an approximate cost per pound for his castings. As a practical foundryman he knew that some castings cost a great deal more than others, but he had no detailed cost figures on either one. Consequently, he favored the practice of accepting an order for a miscellaneous lot of castings at a flat price per pound. According to the general law of averages he knew he was making some of the castings below cost, but he also was sure he was making a good profit on others. Between the two he anticipated making what he considered a just and legitimate profit.

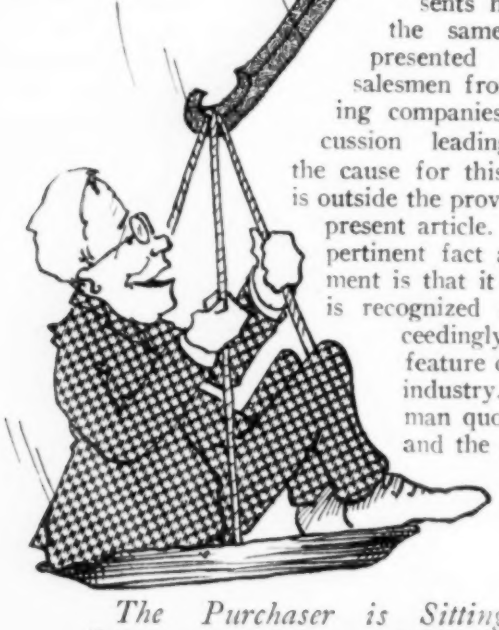
Under certain conditions this method was fairly satisfactory and is practiced yet to some extent. However, under modern conditions where foundrymen are becoming more familiar with detailed costs, the system is condemned without reservation. It is considered a perpetuation of a lazy and slipshod custom and is held mainly responsible for the mistaken premises on which purchasing agents base their conclusions.

Foundrymen have themselves to blame for an impression that has gone abroad and that has been accepted willingly to the effect that castings are a bulk commodity, subject to the same rules of measurement and appraisal as coal, or wheat or iron ore. Subject of course to variation in value according to fluctuations in the market, the purchasing agent cannot see why the foundryman cannot quote him a flat price per pound on a lot of miscellaneous castings ranging in weight from ounces to tons. Further, and this is the particularly

aggravating feature, when he is in the market the second time for a lot of exclusively light castings, he expects the same quotation. He reasons apparently logically that if *pigs* is *pigs*, then castings are castings.

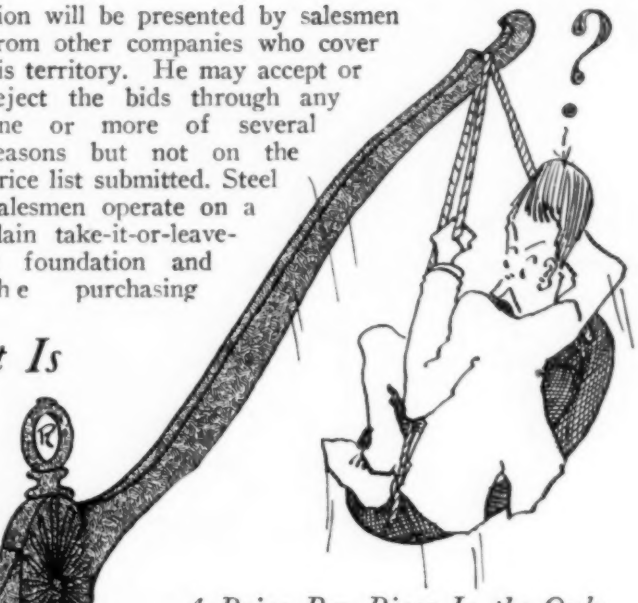
Salesmen to Blame

Foundrymen and their sales agents are responsible primarily for many troubles reflected in present conditions. Their quotations in the past have not been uniform and have been too easily revised under pressure. The same condition obtains to a certain extent even at present and purchasing agents would not be human if they did not take advantage of it. The bewildered foundryman may say: What can I do about it? My competitors almost invariably first quote the price which they hope to receive, but they all are prepared to make concessions if necessary. Contemporary accounts seem to indicate that dickering and chaffering are the recognized and natural features of mercantile transactions among oriental people to whom time is no object and who have one code of ethics in public and another in private life. Theoretically, at least, these features should have no place among the members of a dominant, hard headed, practical people who always are harping on the value of time and the necessity of hewing to the line. Doubters who think the theory is not amenable to practical application are respectfully referred to the methods employed for selling rolled steel. The steel salesman in any given territory has one price. It does not matter what company he represents his price is the same as that presented by other salesmen from competing companies. A discussion leading up to the cause for this condition is outside the province of the present article. The only pertinent fact at the moment is that it exists and is recognized as an exceedingly important feature of the steel industry. The salesman quotes a price and the purchasing agent knows that the same quotation will be presented by salesmen from other companies who cover his territory. He may accept or reject the bids through any one or more of several reasons but not on the price list submitted. Steel salesmen operate on a plain take-it-or-leave-it foundation and the purchasing agent meets them on the same ground. A different atmosphere fills the office when he is dealing with the foundryman. He uses every legitimate, and in some cases illigitimate means to wring a minimum quotation from the foundryman. Under sufficient pressure, the maker of castings quotes a price which he declares, and sometimes actually believes himself, will barely cover the actual cost involved in making the castings. Then the purchasing agent plays his trump card. He admits that the figure is reasonable but he thinks he can do a little better. He expects to hear from a few other foundries and of course will give his business to the one which quotes the lowest price.



The Purchaser is Sitting Pretty on the Practice of Buying all Castings by Weight.

More Weight Is Needed on the Weak Side



A Price Per Piece Is the Only Fair Basis for Selling Castings.

Here is where the first man ruins his case and here is the primal root of the entire castings selling problem. The foundryman declares he has delivered his ultimatum, his absolutely lowest figure and then adds apologetically that he should like to know of any other bids presented. He intimates that if any figures lower than his are submitted, why, er—it is possible that he *might* shave his a trifle nearer the skin.

A purchasing agent may be no more avaricious than the average citizen, but his training has taught him that a penny gained is a penny earned and he certainly is not going to pass up a wide open and gaping opportunity. If the first foundryman finally does land the business he derives about as much pleasure from filling it as the man does who yields up his teeth in the dentist's chair. The analogy is not so far fetched as at first sight might appear. In either case the victim sacrifices something to keep going and it is a matter of common knowledge that sacrifices are not prompted by an anticipation of pleasure.

Dirty Work at the Cross Roads

Reference to illegitimate means as a lever to force prices beyond a normal low level is suggested by a recent experience of a foundryman located in a large industrial community. He submitted a quotation on a certain class of castings and was told by the purchasing agent that his bid was outrageous. He was assured that a foundry situated in a small down state town was prepared to furnish the castings, and in fact had

filled several previous orders at a much lower figure.

This particular foundryman was a product of the new school who had substituted system for the old hit and miss methods. He knew exactly his operating costs and was positive the castings could not be made under ordinary conditions at the figure submitted by the purchasing agent. The more he thought about it, the more interested he became. Finally he decided to secure some general information from an inside source. He appealed to the secretary of the local foundrymen's association for any data he might have on the foundry in this little town which we may call Twinpool.

As a matter of fact it is not the real name of the place but is submitted as an improvement on the actual name as it certainly is an improvement on some of the atrocious names wished on other defenseless communities in their infancy.

In seeking preliminary information on this Twinpool shop, the foundryman had a two-fold object in mind. His own knowledge led him to doubt the purchasing agent's veracity and he wanted to check up on that point. In the second place if he found contrary to his expectations that the statement was true, he wanted to discover at first hand what short cut method was employed.

His surprise, and perhaps gratification, may be imagined when he was told that the Twinpool foundry had been sold a year previously to satisfy creditors claims and had not been operated since that time.

To fortify himself properly and to have something more substantial than hearsay evidence, however reliable, he drove down to Twinpool one day and confirmed the secretary's information on every item but one. The place had been closed for 18 months instead of a year.

The visitor does not claim that he is a wizard or a lightning calculator, but he can add two and two together without making the answer either three or five. He did not learn the entire history of the plant, but he learned enough to confirm him in his original opinion. Selling castings below cost is one of the most efficient and rapid methods yet devised to throw a foundry into the bankruptcy court.

Primed with the most convincing evidence, the foundryman thought he could cover the purchasing agent with confusion. He underestimated that gentleman's ability to juggle with the truth. He admitted calmly that he never actually had bought any castings in Twinpool, but his brother-in-law had bought some there about 2 years ago at the figure which he had quoted.

"You misunderstood me" he explained, suavely "I did not say that I could buy castings from Twinpool Foundry & Machine Co., for 6 cents a pound. What I did say was that the Twinpool Foundry & Machine Co., had quoted castings at 6 cents a pound. True I did not mention the year, but I fail to see what bearing that has on the question!"

Editor's Note:—This is the first of three articles on buyers of castings. The next will appear in an early issue.

Iron Is Poured Through Bottom Nozzle

BY JAMES THOMAS

IN REGARD to the precautions to be observed in handling iron with a bottom pour ladle, the first point is to see that the seat tile or nozzle brick is set plumb. The stopper is placed in the seat and attached to the goose neck as in ordinary steel ladle practice. However, more care is to be taken in seeing that the stopper head is seated perfectly. After the stopper is fastened securely to prevent it from working loose, the nuts holding the sleeves in place should be slacked to allow for expansion. To insure accuracy one man should work the pouring lever up and down several times while a second man examines the stopper head and nozzle to see that they coincide perfectly each time the stopper is lowerd into place. The lever then is locked and the ladle is filled with iron.

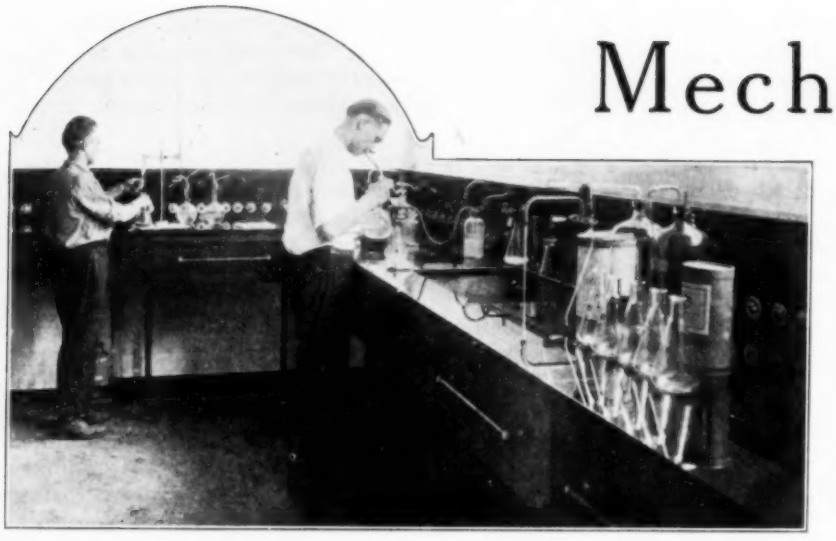
Before the first mold is filled, or after a few thousand pounds have flowed through the nozzle, the operator should bring the stopper down several times to insure a clean shut-off. Sometimes a small amount of metal will chill in the seat and cause a leak if allowed to remain. By opening and closing the nozzle several times before the final shut-off this metal is washed from the seat, and the stopper head fits snugly in the nozzle depression.

After the ladle is emptied or while it is on the return journey for additional metal, the nozzle should be closed tightly and the lever controlling the stopper should be locked by tightening the screw on the side of the slide. If these precautions are observed no trouble will be experienced with the second or succeeding ladles. Stopper heads are prepared in several styles and the manner in which they are attached to the stopper rod may cause trouble. However, if the head is attached properly, that is if it is attached in a manner that will prevent it from working loose, then one type of head will be found as satisfactory as another. Some of the stopper heads are screwed on the bottom of the rod while others are held in place by a thin cotter pin slipped through a slot in the end of the rod. Sometimes the head or nozzle may spall a little and the chip may lodge in such a manner as to cause a leak, but this is rather a rare occurrence.

At two typical plants, the Valley Mold & Iron Corp., Sharpsville, Pa., and the Penn Mold & Manufacturing Co., Dover, O., where the metal is taken direct from the blast furnace, a 2½-inch nozzle is used in the bottom of the ladle. At the plant of the Illinois Steel Co., South Chicago, where the metal is taken from a mixer and therefore is at a lower temperature, a 3-inch nozzle is used. Experiment has demonstrated that smaller sizes cause trouble.

The bottom of the ladle is flat with a gradual slope toward the nozzle so that the metal may drain out completely. It is not advisable to form a depression in the vicinity of the nozzle. The metal in the depression has a tendency to chill and this in turn may result in pulling the head from the stopper rod. Where the ladle is used in connection with a blast furnace the same stopper will serve for an entire cast. After the cast the ladle should be dumped and cleaned and fitted with a new stopper. The old stopper might serve for a second cast, but the procedure is extremely risky.

At the plant of the Penn Mold & Manufacturing Co., where 225 tons a day is melted in a cupola the stopper is set in the ladle in the usual manner before the first iron is tapped. The iron in the first ladle is poured over the lip, but the remainder of the heat is poured through the nozzle in the bottom. It is not unusual for one stopper to outlast the heat.



Mechanical Aids

Equipment Takes Sand Department in a Large

MORE than 9000 patterns for switches, frogs, crossings and other miscellaneous railroad equipment, stored upon the shelves in a department set apart for the purpose, indicate the extent to which manganese steel castings have been adopted and also serve to illustrate the stupendous manufacture of railroad equipment carried on in the plant of Pettibone, Mulliken & Co., Chicago. The history and growth of this plant practically parallels similar features in the rise of Chicago to its present position as a great railroad terminal and junction point with main lines radiating in almost every direction.

In 1880, the nucleus of a modest little plant for the manufacture of track accessories was set down in the old Goose Island district near the Chicago river. It expanded steadily to a point where no more territory was available and in 1903-04 the plant was moved to the present site at that time known as Cicero, but now part of the city of Chicago. The manufacture of manganese steel castings first was taken up in 1912 and has been continued since that time. The original foundry building has been extended from time to time as conditions warranted and mechanical equipment has been installed on the same basis as needed.

The foundry building 130 x 740 feet is laid off in two main longitudinal divisions each 65 feet wide and with 35 feet clearance under the crane runways. Extensive windows along both sides and ends with additional rows of windows in the roof furnish ample light and ventilation. Wide aisles, plenty of room, neatness and order are held to be cardinal principles in all parts of the plant. Even in the foundry where application of these principles usually is regarded as a hopeless, if not impossible task, the effect of the general policy of the company is apparent. The walls are painted white, the windows are kept clean, electric current is employed to melt the metal and anneal the castings, flasks are piled in an orderly manner, molds are arranged on the floor with a generous margin of space surrounding them so that the metal may be poured with maximum ease and safety. Molds are prepared under similar favorable conditions. There is no crowding. Under normal conditions the foundry has a capacity of 800 tons a month of manganese, plain carbon and alloy steel castings.

General Plant Layout

Sand mixing, molding and coremaking are carried on the north bay, while the metal is melted, poured and the castings are cleaned and annealed in the south bay of the building. In this manner the sequence of operation is continuous, flowing as it does up one bay and down the other. All the supplies with the exception of the metal stock are unloaded at the west end of the north bay and deposited by a crane in any one of the several concrete bins provided for the purpose at that end of the building. The scrap for the furnace charges, made up exclusively of low carbon material, enters the east end of the south bay on a standard-gage track and is unloaded by a magnet. A reinforced concrete retaining wall 6 feet high on either side of the stock pile maintains it in an orderly condition. The east end wall of the south bay holds the material in place at one end and the retaining wall supporting the furnace platform forms the boundary at the other end. From the foregoing it may be noted that the steel stock is stored in the main building, under cover and immediately adjoining the furnaces.

Considering the various steps in the sequence of operation from raw material to finished casting, the first feature to attract attention in this foundry is an

The South Bay Contains the Ovens With Transfer Tracks for the Heavy Molds—The Shakeout Platform May Be Noted in the Background

Handle Sand in Manganese Shop

From the Shakeout Floor and Returns It to the Molding Chicago Steel Foundry — Laboratory Control Prevails

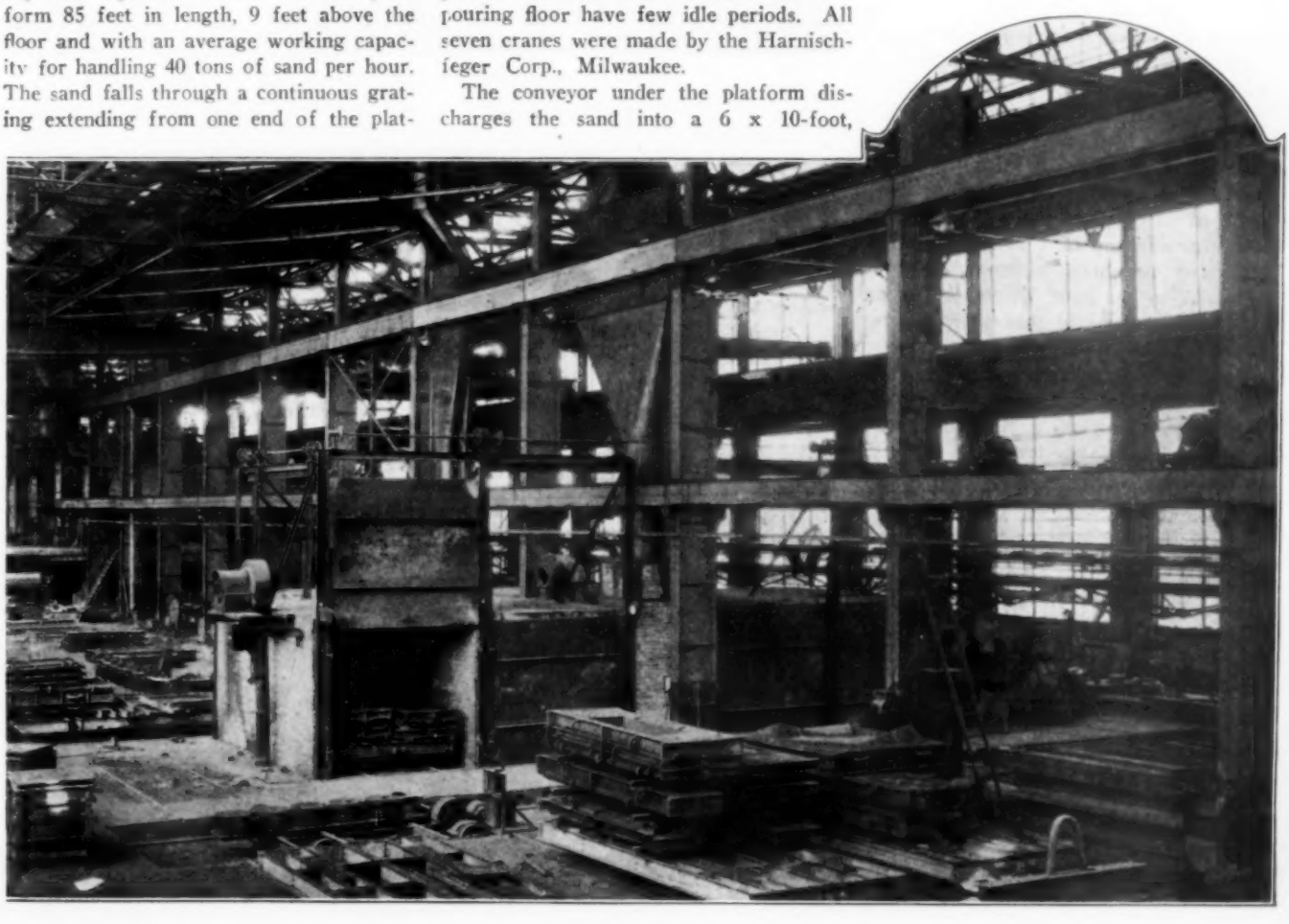
By Pat Dwyer

extensive sand handling system recently installed by the Link-Belt Co., Chicago. It begins with an elevated shakeout platform close to that part of the floor in the south bay where the castings are poured and terminates in a long belt conveyor located close to the wall in the north bay which discharges the prepared sand through a number of chutes upon the various molding floors. In its general features the equipment resembles several others installed by the same company in various foundries, but many of the details differ in construction or application and present points of interest.

Details of Operation

After the castings have cooled sufficiently in the molds the flasks are lifted by one of the four cranes in the south bay and deposited on the shakeout platform 85 feet in length, 9 feet above the floor and with an average working capacity for handling 40 tons of sand per hour. The sand falls through a continuous grating extending from one end of the platform to the other on to a 72-inch apron conveyor. The empty flasks are placed on a roller conveyor and pushed by hand across the dividing line which separates the north from the south bay, the platform at this point being extended alongside the core-oven wall for the purpose. By this arrangement the three cranes in the north bay are in a position to pick up the empty flasks and either place them on the molding floor to be used immediately, or deposit them at the extreme east end of the bay where they remain in storage until needed. This can be done while the cranes in the south bay are engaged in other duties, tapping the furnace, pouring the metal, closing dried molds or placing the poured molds on the shakeout platform. With two electric furnaces melting an average of four heats each per day, it is apparent that the four cranes over the pouring floor have few idle periods. All seven cranes were made by the Harnischfeger Corp., Milwaukee.

The conveyor under the platform discharges the sand into a 6 x 10-foot, rotary breaker which smashes the dried sand lumps and cores to a workable size. The breaker is equipped with a magnetic separator which removes all material susceptible to magnetic influence and discharges it through one end into portable boxes which are removed when filled and dumped into one of the charging pans in the vicinity of the melting furnaces. Nonmagnetic material, wood wedges, sand lumps, manganese steel scrap and other foreign material too large to pass through the 1-inch perforations in the breaker barrel, is discharged upon an 18-inch picking belt conveyor from which everything but the sand lumps is removed by a man stationed alongside for the purpose. The refuse sand falls into a bucket elevator which lifts it to the mezzanine floor where it is fed through a chute to a cross belt conveyor that car-



ries it either to a bin for storage or directly into a railroad car spotted outside the end of the building.

All the sand that falls through the perforations in the breaker falls upon a 24-inch belt leading to a second bucket elevator. This second conveyor belt also is provided with a magnetic separator which removes any small iron or steel particles that escape the attraction of the magnet in the first treatment. The bucket elevator discharges the sand which is practically clean into a revolving hexagonal screen provided with ¼-inch perforations. Any material that will not pass through this screen is passed through a chute to the refuse conveyor, 18 inches wide and 90 feet long which discharges as previously stated either into a bin or a railroad car.

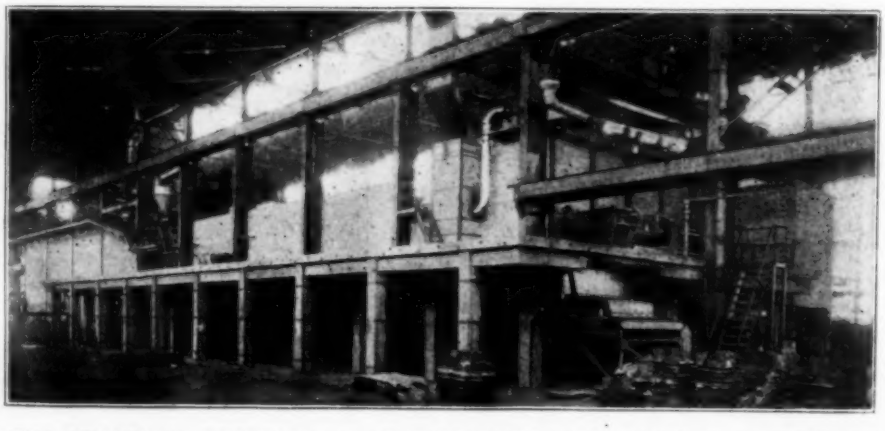
The screened sand falls on to a reciprocating flight conveyor 36 inches wide extending from the screen to the north wall of the building and operating at a speed of 20 strokes per minute. Clay in any amount up to a maximum of 10 cubic feet per hour, automatically may be added to the sand at the beginning of its journey on this conveyor. Water also is sprayed on the sand at this point and the various elements become thoroughly incorporated before the sand arrives at a point close to the north wall where it is discharged upon a conveyor belt 460 feet in length, 24 inches wide, located about 10 feet above the floor, driven by a 10-horsepower motor. This discharges the prepared sand through any one of 8 chutes located at equidistant points, on to the molding floor. A plow, or stop which may be raised or lowered above the belt in front of each chute deflects the sand as desired. If necessary or expedient, a box may be placed beneath the chute and filled and then conveyed by lift truck to any part of the floor.

To compensate for the addition of new sand in the facing, it becomes necessary to dispose of a certain amount of old sand day by day. Otherwise the amount of sand on the floors would increase to a point that would render working conditions impossible. In this foundry a definite amount of the sand after it leaves the breaker is deflected to the refuse belt which carries it away with the other refuse. Of course the amount, varies depending on operating conditions and is decided arbitrarily by the superintendent as the occasion arises.

Silica sand, clay and coke are unloaded by crane directly from the railroad cars and stored in a series of concrete bins inside the west end of the north bay. The bins have been designed to offset the necessity of securing supplies from outside in the winter. The sand bin has a capacity of 125 cars, the clay bin 2 cars and the coke bin, 4 cars. Coke in this plant is used only to fire the core ovens and therefore the requirements are not of a kind to excite comment.

New silica sand for core and facing mixtures is taken from the storage bin and fed upon an apron conveyor which discharges into a crusher. From the crusher it is elevated to a chute leading to a rotary type dryer with a capacity of 10 tons per hour and fired from the lower end by a forced-draft coke burner. The dryer feeds into a bucket elevator which carries the sand aloft to an overlead steel hopper of 50 tons capacity. The drying apparatus has been installed more as a precautionary measure than as an actual necessity. Under ordinary circumstances, the new sand does not require to be dried and is carried direct from the concrete bin to the overhead 50-ton steel hopper. A second hopper of similar capacity is located close to the first. It is loaded with old molding sand from the reciprocating flight conveyor. This portion of the sand is deflected to the storage hopper before it has been treated with clay and water.

Tension Testing Machines, Drills for Sampling, Special Furnaces and Other Apparatus in the Laboratory Are of the Latest Design



THE SHAKEOUT PLATFORM IS 85 FEET LONG AND HANDLES 40 TONS OF SAND PER HOUR

INSTALLATION AND CARE OF AIR COMPRESSORS

LOCATION

Provide plenty of light and ample room all around the compressor for cleaning and inspection. In foundries, wood working plants, etc., where there is excessive dust, locate the air compressor in the main engine room if this is not possible install in a dust tight room with provision made for drawing clean air from the outside to compressor intake.

PIPING

A The air intake should be run outside the engine room so as to admit the air at some height above the ground level. The end should be suitably hooded and provided with a wire screen and strainer to keep out dust and dirt. The strainer screen must have at least four times the area of the suction pipe, and should be so constructed as to be easily removable for cleaning, as it will become foul with rubbish to such an extent as to choke off the air supply. It is necessary that the piping be full diameter of the intake opening on the air cylinder with an increase of 1 inch in diameter over this size for every 8 feet in length. An actual gain in delivery of 1 per cent is obtained for every 5 degree temperature reduction of the intake air. This is shown by the accompanying table.

Initial Temperatures Degrees Fahr.	degrees absolute	Relative capacities	Initial Temperatures Degrees Fahr.	Degrees absolute	Relative capacities
—20	440	1.18	70	530	.980
—10	450	1.155	80	540	.961
0	460	1.13	90	550	.944
10	470	1.104	100	560	.928
20	480	1.083	110	570	.912
30	490	1.061	120	580	.896
32	492	1.058	130	590	.880
40	500	1.040	140	600	.860
50	510	1.020	150	610	.852
60	520	1.00	160	620	.838

CLEANING THE INTAKE AIR

In many industries it is impossible to locate a compressor intake so that clean air can be taken into the machine without some form of air cleaner or filter being connected with the intake piping. Wherever dust or foreign matter continually is sucked into a machine, this causes rapid wear and forms a coating on cylinders, valves, etc. Where such conditions exist, an air cleaner must be used.

A simple form of cleaner which can be made at any plant is shown in Fig. 1. It consists of a wooden frame box made with removable panel frames covered with heavy ½-inch mesh wire to which cheese cloth or loosely woven cotton flannel is tacked. The cheese cloth takes up all the heavy particles of dust and foreign matter, and when the cloth gets completely covered it should be renewed with new cloth. Ample screen area should be provided, at least 1 square foot of surface per 25 cubic feet per minute free air capacity of the compressor.

From Trade Standards adopted in 1923 by the Compressed Air Society, 50 Church St., New York.

(*Continued on Data Sheet No.* 562)

INSTALLATION AND CARE OF AIR COMPRESSORS

(*Continued from Data Sheet No.* 561)

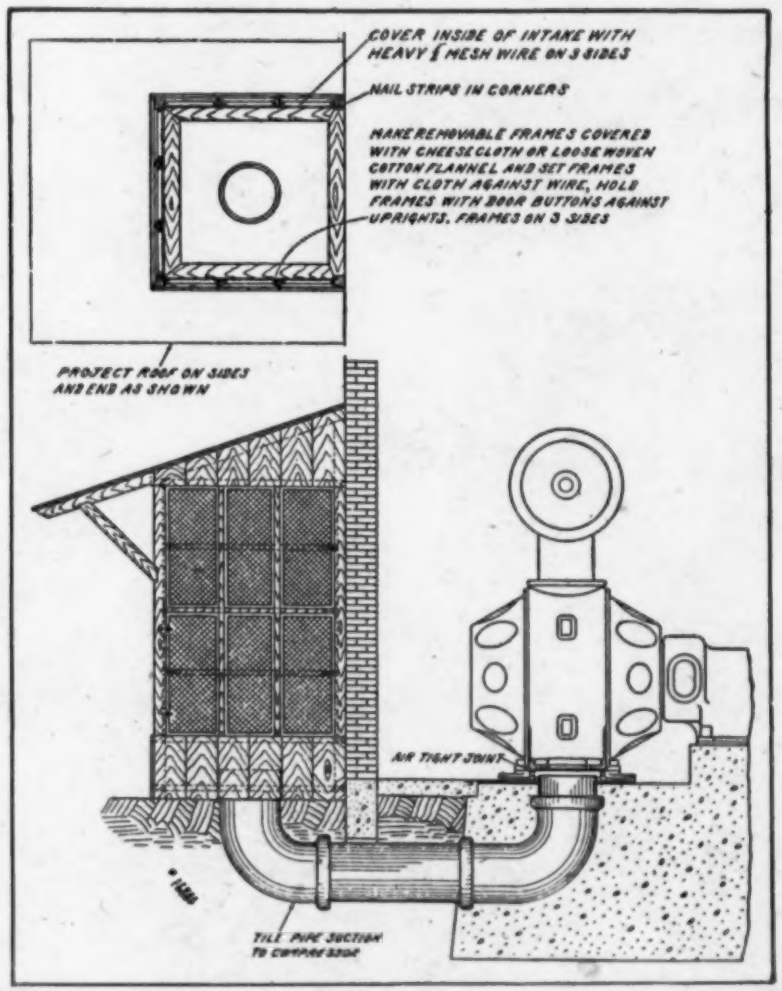

COVER INSIDE OF INTAKE WITH HEAVY ½ MESH WIRE ON 3 SIDES
NAIL STRIPS IN CORNERS
MAKE REMOVABLE FRAMES COVERED WITH CHEESE CLOTH OR LOOSE WOVEN COTTON FLANNEL AND SET FRAMES WITH CLOTH AGAINST WIRE, HOLD FRAMES WITH DOOR BUTTONS AGAINST UPRIGHTS. FRAMES ON 3 SIDES
PROJECT ROOF ON SIDES AND END AS SHOWN
AIR TIGHT JOINT
TILE PIPE SUCTION TO COMPRESSOR

FIG. 1—A SIMPLE FORM OF CLEANER FOR THE INTAKE OF AN AIR COMPRESSOR MAY BE MADE IN ANY SHOP

(*Continued on Data Sheet No.* 563)

THE FOUNDRY DATA SHEET, FEB. 15, 1925

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

Around the World with The Foundry

Little Journeys to the homes of our readers

Australia!

THE soft velvet stars of the Southern Cross looked down for centuries upon a land considered so worthless that England at one time used it as a penal settlement. The same constellation now shines nightly on one of the most modern and enlightened countries on the face of the earth and one of the brightest jewels in the world-embracing girdle of the British Empire.

Time was when the name Australia suggested a country sparsely settled by kangaroos, convicts, boomerang throwers and bushrangers. Those days have gone by and now the great island commonwealth counts her inhabitants by the million, where once she counted them by the dozen.

The addition recently of electric steel melting units rounds out her complete independence in the foundry industry. Two hundred and fifty-four plants supply practically all the castings used in Australia. At the offices and shops of the Crown Stove & Foundry Co., Queensland; The Broken Hill Proprietary Co., Ltd., New Castle and the Barrier Brass & Aluminum Works, North Melbourne, and 120 other foundries scattered over the length and breadth of the land, The Foundry is delivered twice a month and serves to keep those in authority advised on all worthwhile developments in the industry.

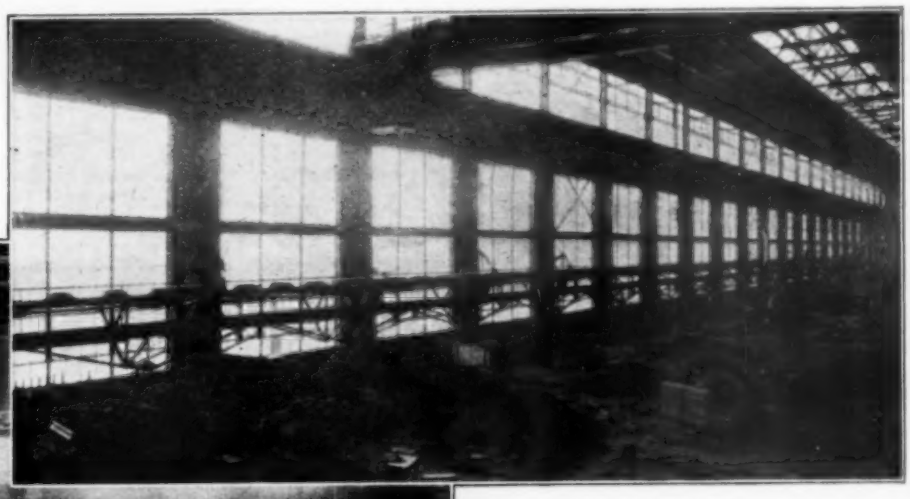
"Wherever metals are cast you'll find THE FOUNDRY"

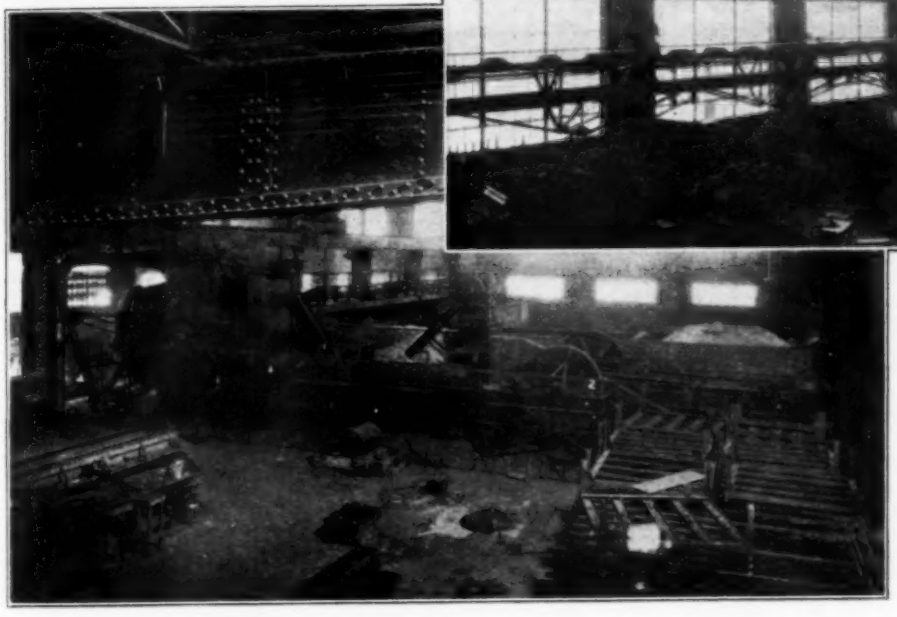
Each hopper is provided at the bottom with a hand-controlled gate through which the sand is allowed to fall either into a truck or a wheelbarrow by which it is taken to the mixers.

Facing and Core Sand

Old and new sand are used in varying proportions for core and facing mixtures depending on the size and shape and other factors connected with the castings to which they are to be applied. The various mixtures are prepared in a battery of three mixers of the muller type made by the National Engineering Co., Chicago. One of the mixers is reserved for the core sand mixture and the remaining two are employed in preparing facing sand. Each mixer is equipped with a loading device which receives a definite amount of material at the floor level, hoists it to a point where it may be discharged into the mixing pan, and then returns for a second load. The pans are supported on suitable stands at a sufficient height above the floor to permit a box loaded on an electric truck to be pushed underneath to receive the batch of sand after it has been prepared. The trucks convey the sand to any point on the floor where it may be required.

The coremaking department is located on the mezzanine floor in that part of the north bay devoted to the sand mixing equipment. It is located directly above the mixing pans referred to in the preceding paragraph and is provided with an elevator for taking the prepared sand up and the dried cores down. The cores are made on a long bench erected on the center of the floor and loaded on racks which are conveyed by electric lift trucks to a battery of eight, two-story core ovens specially designed and erected by Holcroft & Co., Detroit. The floor of one tier of ovens is flush with the core room floor while the floor of the second tier is flush with the main floor of the foundry.





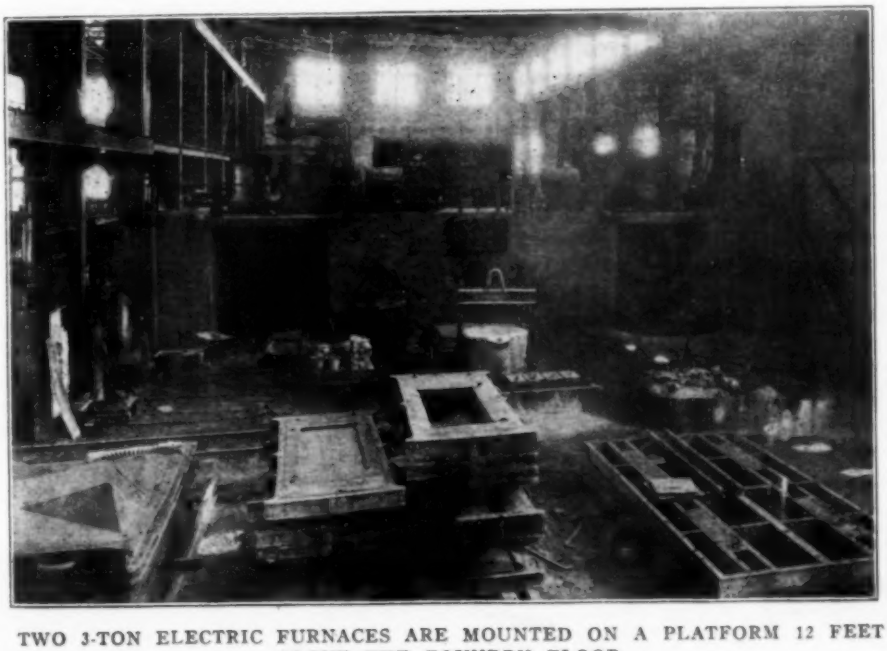
The Core Room Is Located on the Mezzanine Floor as Shown Below —A Conveyor Belt, 450 feet long, Discharges Prepared Sand on the Molding Floor Through Chutes.

Coke Fired Ovens

Core ovens, also the five large ovens in which the molds are dried, are fired with coke from underground chambers. The fuel is dumped into these chambers through suitable manholes in the floor. Except at periodical intervals when a man is engaged in attending the fires, the manhole covers are in place and do their share in maintaining the clean appearance of the floor.

The ovens are located near the center of the foundry and extend an equal distance into each bay. One single oven, 30 feet long is provided with a door at each end. The long molds are loaded on the car in the north bay and after they are dried they are hauled out through the doorway in the south bay.

A battery of four ovens is located close to the single oven. This battery occupies the same relative position between the two bays as the single oven, but each oven is only provided with a single door and all the doors are in line on the east instead of facing north or south as in the case of the single oven. The molds are loaded on low cars operating on standard gage tracks. An electrically operated transfer



TWO 3-TON ELECTRIC FURNACES ARE MOUNTED ON A PLATFORM 12 FEET ABOVE THE FOUNDRY FLOOR

car on a depressed track extending across the front of the battery of ovens, conveys the load car to any desired oven. The same car carries the cars of dried molds to a point in the south bay where they may be removed by one of the cranes.

With the exception of the space occupied by the sand bins and the core-room at one end, the entire north bay is devoted to making the molds or at least preparing them up to a point where they are ready to be placed in the drying ovens. On account of the limited number of castings ordered from any one pattern—frequently only one—the management has not favored the adoption of molding machines to any extent. A few small machines have been installed, but nearly all the molds are rammed on the floor with air-rammers. The molders are paid on a piecework basis and many unusual factors in connection with adapting the flasks and bars and the amount of gaggering required have to be taken into account in setting the rate.

The first 2-ton electric furnace for melting the metal was installed in 1919. It is a heroult furnace made by the American Bridge Co., New York. Two additional furnaces of the same type and supplied by the same company have been erected since that time, one of 3 tons capacity in 1923 and a duplicate recently. These two furnaces are mounted on a platform 11 feet above the foundry floor and extending all the way across the south bay near one end of the building. A removable steel platform in front of each furnace is lifted by the crane and placed to one side on the furnace floor while the ladle is under the spout. At all other times it remains in place in front of the furnace.

While the company operates its own power house and develops all the electric current for its own use, an exception is made in the case of the melting furnaces. Current for the furnaces is secured from the Chicago Commonwealth Edison Co. The chamber under the furnace platform is occupied by the transformers, oil switches, elevating and tilting machinery and store rooms. The switchboard, control levers and water supply valves are located at convenient points above the charging floor where the levers and valves are protected from injury behind a special ⅜-inch steel shield.

Long, narrow steel pans manipulated by one of the cranes are employed for charging the furnace. The pan first is placed close to the stockpile where it is loaded by a magnet suspended from the crane. Then it is picked up by chains attached to four points. The open end is inserted in the charging opening in the furnace, the front chain is released and when the crane pulls up on the back chain, the contents of the pan slide on the furnace hearth.

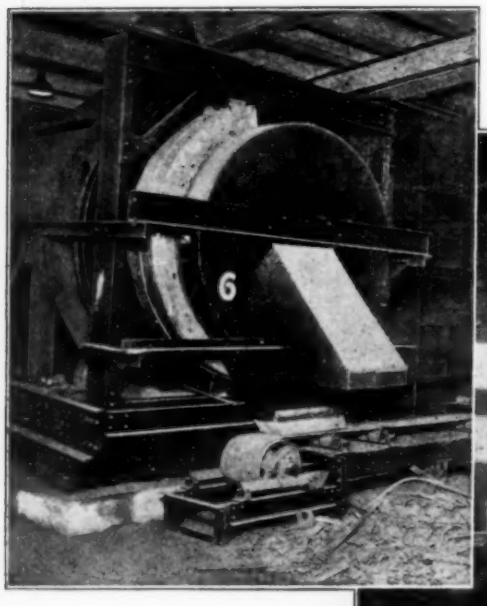
Manganese Steel

In making plain, low carbon steel, the entire charge is melted down and tapped in the usual manner. To convert this steel into manganese steel or other forms of alloy steel, additions of the necessary elements are made to the bath before the metal is tapped from the furnace. A preliminary analysis of the metal is taken to determine the carbon and manganese content and the necessary amount of alloy material is added to meet the specifications in the finished casting. For manganese steel, the 80-per cent ferromanganese is raised to a temperature of approximately 1000 degrees Fahr., before it is shoveled by hand into the furnace. Approximately 800 pounds of ferromanganese are required to treat a 3-ton heat, to insure a manganese content of approximately 13 per cent in the resulting castings.

The chemical laboratory, 25 x 30 feet, and the physical laboratory 16½ x 40 feet are housed in a building which adjoins the south wall of the main building in the vicinity of the furnaces. The chemical laboratory is completely equipped not only for making quick test analyses before the heats are tapped, but also for all the routine work required in connection with the general operation of the plant. The extent of the work which falls within the scope of the physical laboratory may be gaged from a contemplation of the list of equipment which includes two heat treating furnaces, one electric arc furnace, two quenching tanks, one oil bath, one 16-inch lathe, one drill press, one power hacksaw, one pedestal grinder, one tensile testing machine and an elaborate electric switch board for obtaining any desired voltage from either direct or alternating current.

Three special rooms are set aside for the study of metallographic problems that

(Concluded on Page 160)



All Magnetic Material is Collected in the Breaker and Discharged at the Side

Sand Falls Through Gratings on the Shakeout Floor to a 72-Inch Apron Conveyor That Discharges Into the Breaker

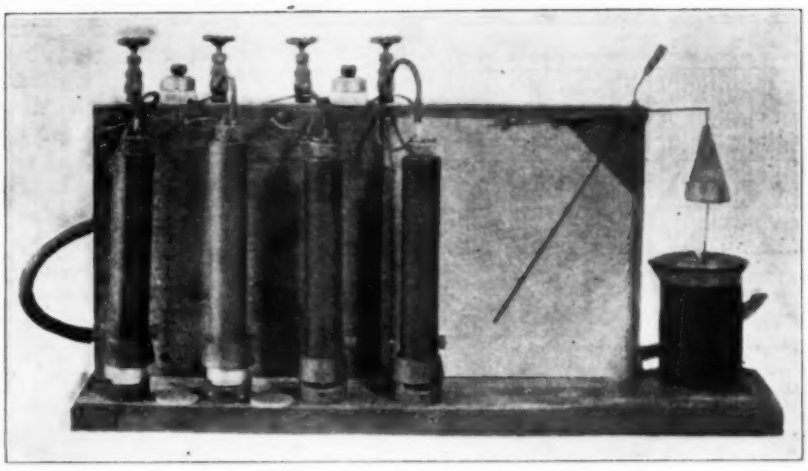


Fig. 1 — Apparatus showing four complete drying outfits for eliminating moisture rapidly in one to four samples of molding sand at the same time

Controling Moisture in Sand

Temper Influences the Bond, Permeability and Gas Content of Sands

By A. A. Grubb

The Ohio Brass Co., Mansfield, O.

SYSTEMATIC control of the moisture content of foundry sands has been undertaken by few foundries. This is not entirely because of the failure to recognize its bearing on foundry losses, for improper temper frequently is mentioned in connection with sand troubles. In the replies to the sand investigation questionnaires which the American Foundrymen's association sent out two years ago to the nonferrous and malleable foundries of the country, it was estimated that about 40 per cent of the sand troubles were due in part to incorrect temper. Too close sand and defective bond also were blamed for many losses. Recently considerable attention has been given to these last mentioned characteristics and excellent methods for measuring and controlling them have been developed, but the most important factor, moisture content, has been neglected.

Temper is an important factor because it influences the bond, permeability and gas content of the sand and also affects the fluidity of the molten metal.

The bond strength of a given sand is expressed by the tensile strength of a standard specimen or as measured by the standard American Foundrymen's association method. A low moisture content gives a low bond value. At higher moisture contents, greater bond values are obtained until an excess of water is added, when the bond decreases. Similarly, there is a moisture content at which maximum permeability is obtained, further additions of water causing the sand to tighten. Fig. 2 shows curves plotted from data obtained on a sample from a molding floor under operation and illustrates the relation between bond and permeability. The shape of such curves and the particular moisture contents at which maximum bond and maximum permeability occur vary for different sands. The point is that there are certain moisture contents at which the best bond and the greatest openness are obtained, too much or too little moisture resulting in less favorable casting conditions.

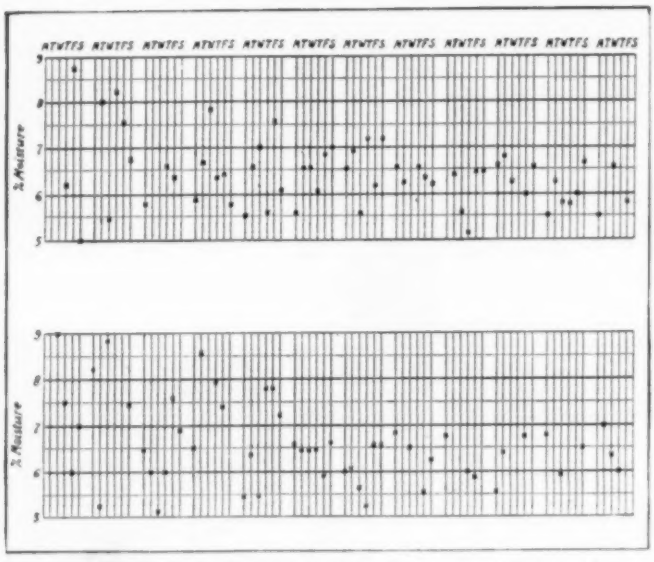
The effect of temper on the gas content of the sand also is highly important in the case of green molds. Molten metal vaporizes the water in the sand to a depth varying from ¼ inch to 1 inch from the surface of the casting. Each cubic inch of sand thus dried gives off about 30 cubic inches of water vapor for each per cent moisture it contains. This gas sets up a back pressure against the metal and must be allowed to escape through vents or through the sand if a perfect casting is produced. So, every bit of moisture in the sand in excess of that actually required to produce the needed bond and permeability, may not only tighten the sand making it more difficult for gases to escape, but actually increase the volume of gas generated when the mold is poured. It is not unusual to find a sand heap which should be worked at 6 per cent moisture containing 8 or 8.5 per cent. We have found them as high as 10 per cent. Even 8 per cent moisture means an excess of 33 1/3 per cent, a third more gas in the mold than is necessary and correspondingly greater chances for blown or misrun castings.

Excess moisture hastens the freezing of the metal. It takes as much heat to vaporize the water in tempered sand as it does to heat the dry sand 300 to 400 degrees Fahr. This heat is taken from the metal as it runs into the mold making it cooler and less fluid.

It is unfortunate that the ill effects of excess moisture in sand are cumulative. It tends to tighten the sand, creates more gas and makes the metal cooler and more sluggish. The three factors act together to produce blows and misruns. If the permeability-moisture curve has a flat peak, or a maximum openness is obtained over a wide range of moisture contents, the sand should be worked as dry as is practicable to hold down the gas content and cooling tendency.

In studying our brass foundry molding losses, the considerations mentioned led to a careful investigation of temper conditions in the sand heaps. Samples from several floors were tested for bond and permeability at various moisture con-

A PAPER dealing with the reclamation of molding sand by A. A. Grubb and F. L. Wolf which was presented at the Milwaukee convention of the American Foundrymen's association 1924, and abstracted in the Feb. 1 issue of THE FOUNDRY described a number of important tests and showed how mulling increases the bond of heap sand, refuse, reclaimed and new sand mixtures. The large number of inquiries received by the authors asking for details concerning the apparatus and methods used in testing the sand led Mr. Grubb to write this article. He describes in detail the apparatus and the methods of procedure in the rapid determination of sand quality.—The Editors



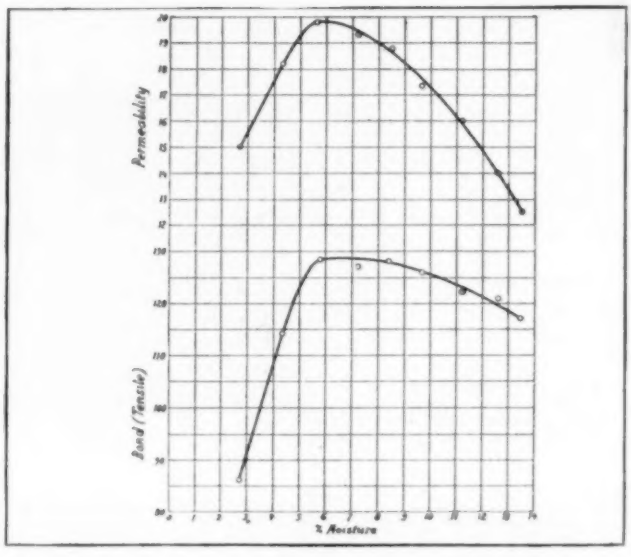


FIG. 2—CURVES, PLOTTED FROM DATA OBTAINED ON A SAMPLE OF MOLDING SAND, ILLUSTRATE THE RELATION OF BOND AND PERMEABILITY TO MOISTURE. FIG 3—MOISTURE VARIATION ON TWO FLOORS OF MOLDING SAND COVERING A PERIOD OF THREE MONTHS

tents and it was determined that best molding conditions could be obtained when the sand carried between 6 and 7 per cent moisture, a little less being preferable when bond conditions were good. A number of moisture determinations then were made on one heap over a period of a week. They ranged from 5 to 9 per cent. Ten floors were examined and they showed practically the same variation.

It was evident that we could not hope to control the temper by making frequent determinations and then adding water or dry sand. Forty floors were in operation, each with its own sand heap. Metal was poured at irregular intervals and the sand was worked over several times a day. With a continuous sand conditioning plant the problem would have been easier to handle. Under existing conditions the best method to pursue was to train the molders to keep their heaps in a more nearly correct condition, and this we undertook to do by the following procedure.

An Omission

Through unfortunate error a portion of the paper by F. L. Wolf and A. A. Grubb which was abstracted under the title Reclaiming Molding Sands in the Feb. 1 issue, page 116, was omitted. This portion gave acknowledgement to the National Engineering Co. which donated a muller type mixer for the use of the reclamation committee of the American Foundrymen's association. This mixer was the one which was used in the experiments at the plant of the Ohio Brass Co., Mansfield, O.

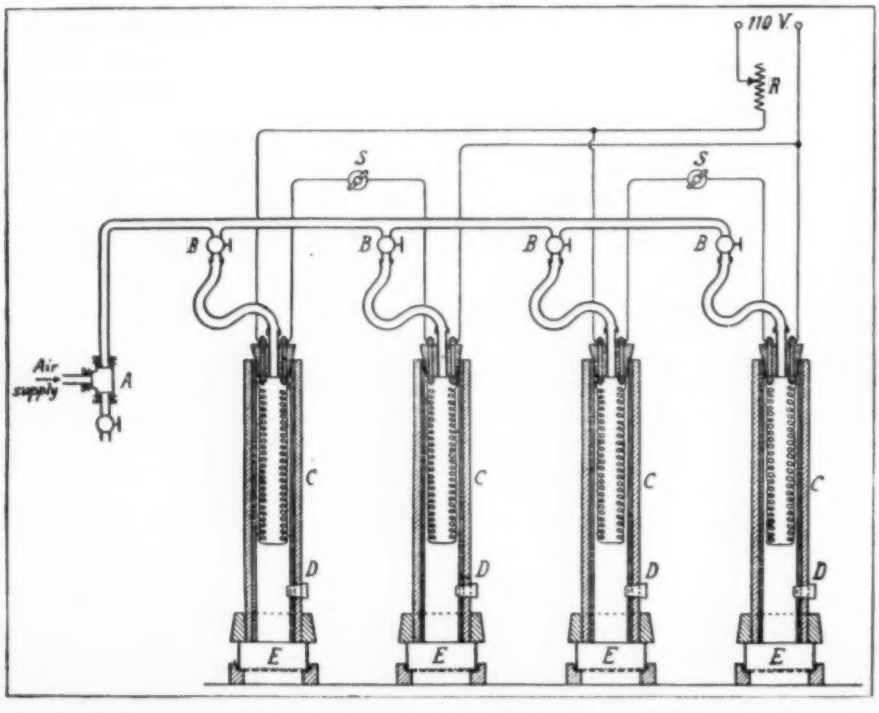


FIG. 4—HEATING ELEMENTS CONSIST OF SPIRALS OF CHROMIUM STEEL WIRE

The heaps were sampled each day and the moisture determined in the laboratory. The samples were taken by the molders themselves and, they were asked to express their opinion of the temper. The tests were made immediately and the results were reported back to the molders and their instructors. The tests were also plotted on charts and exhibited for inspection. At first these results were expressed as percentages, and the chart meant nothing to them but tact on the part of the assistant who was a journeyman molder soon aroused considerable interest and they put forth an effort to keep the sand at the right temper. Fig. 3 shows the charted results of determinations on two floors over a period of three months. These particular molders were much interested in the scheme and showed marked improvement. Similar improvement was made by most of our molders. However, a few showed little or none. We found that a great deal depended on the attitude of the molder, the stubborn *know-it-all* worker getting but little benefit from the tests.

However, these men are in the minority, so in general the results have been good. Since starting this work losses due to blown and misrun castings have been reduced more than 60 per cent. This reduction cannot be credited entirely to moisture control as bond and permeability control was inaugurated about the same time. However, there is no doubt, but that proper temper of sand has been an important factor.

The determination of moisture in molding sand is comparatively simple from

a laboratory point of view. The standard method consists in weighing 100 grams of sand, drying it for one hour at 105-110 degrees Cent. and reweighing. The difference is taken as the percentage of moisture. The method is rather cumbersome for control work where rapidity is required, so efforts were made to develop a more rapid method.

Experiments were made at removing the water at temperatures considerably above 212 degrees Fahr. to cut down the time. By using silica capsules, heating to 1000 degrees Fahr. and cooling on a water cooled plate, we were able to reduce the time from one hour to about 11 minutes for a complete determination. At these high temperatures, certain volatile matter in addition to the water was driven out but it was hoped that this would be sufficiently constant that a relation between the loss in weight and true water content could be obtained. This did not prove to be the case even when temperatures as low as 600 degrees Fahr. were used, so the method was abandoned.

Experiments were then made with view to determining the maximum temperature at which moisture could be removed from heap molding sand without serious error. The results of a series of tests made at temperatures ranging from 212 degrees Fahr. to 700 degrees Fahr. indicated that at 400 degrees Fahr., the error probably would not exceed 2 per cent to 3 per cent at the most. For example, a correct moisture content of 6.0 per cent might show as high as 6.12 or possibly 6.18 per cent if the sample was dried at 400 degrees instead of 212 degrees Fahr. At 500 degrees we obtained an average error of a little less than 7 per cent. We concluded that for practical purposes it would be well to make our determinations at about 400 degrees Fahr.

The apparatus shown in Figs. 1, 4 and 5 then was designed and constructed. With this outfit we made single determinations in six to eight minutes and found no difficulty in making 30 or even 40 determinations in an hour.

Description of Apparatus

The machine consists of two parts, an apparatus for drying the moisture out of the samples rapidly and an automatic weighing device. Four complete drying units and the weighing device are mounted on one support for convenience.

The moisture is removed by passing hot dry air through the sample. Air is supplied through the trap *A*, to the needle valves *B*, Fig. 4 which regulate its flow into the heating chambers *C*. The heating chambers consist of 10 inch lengths of brass tubing 1¼ inches in diameter. The lower ends of these tubes fit snugly in holes cut through large rubber stoppers. The upper end of each tube is fitted with a cork stopper through which passes the air line from the needle valve. This stopper also serves to support the heating element which consists of a spiral of chromium steel wire. One of the electrical connections extends down into the tube and is covered with clay insulators to aid in supporting the heating element. Two heating units are connected in series. There is a snap switch, *S*, in each circuit and one rheostat, *R*, controls the temperature in the heaters.

The heating chambers are insulated on the outside with asbestos and fiber tubing and are lined with sheet asbestos. Small holes at *D* permit the insertion of a thermometer to check the temperature when desired. Ordinarily, these holes are closed with cork stoppers. Thermometers bent at right angles, inserted here and

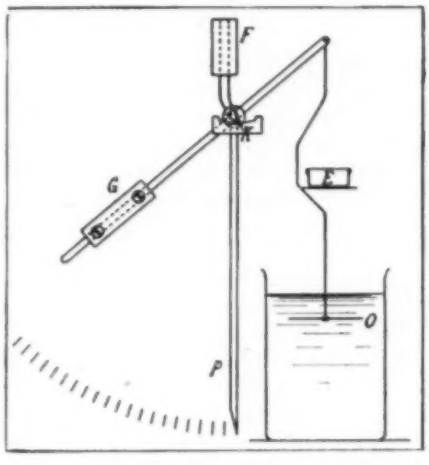


FIG. 5—APPARATUS FOR WEIGHING SAMPLES OF MOLDING SAND RAPIDLY

fastened permanently on the sides of the heating chambers would be convenient. The heating chambers are connected to the needle valves by soft rubber tubes.

Aluminum capsules or dishes 1 inch deep and 2 inches in diameter contain the samples of sand. These capsules, *E*, in Fig. 5, have perforated bottoms over which lay snugly fitting disks of 270 mesh bronze wire gauze. They are supported in such a manner that the air can pass out readily through the bottom. The capsules with gauze disks and covers are of uniform weight.

The weighing device operates on the same principle as some postal balances on the market. Fig. 5 shows the essential details. The weight *F* is adjustable and serves to determine sensibility and also the length of the scale. The weight *G* is also adjustable and is used in balancing. A small circular plate, *O*, suspended from the pan and immersed in oil damps the motion of the beam and pointer.

The scale covers weights only from 40 to 50 grams and is graduated in tenths of a gram. A specially constructed chart is located immediately behind the pointer and is arranged to indicate moisture percentages directly. It is constructed by calculating the moisture percentages corresponding to a number of weights before and after drying and plotting these valves.

The four heating chambers and the weighing device are located on the front of the support while the trap and rheostat are fastened to the rear side.

Determination of Moisture

In making a moisture determination the apparatus is operated as follows:

The needle valves are opened and so regulated that an air current just barely perceptible is noted issuing from the bottom of the tubes. The current is then turned on and so regulated that a temperature of about 400 degrees Fahr. is obtained. These adjustments when once made require but little further attention. The capsule is filled with the sample and covered. It is then placed on the pan of the balance and its weight noted. We have found it convenient to record this weight on the capsule, using a soft lead pencil. No other record of the weight is made. The cover is then removed and the capsule placed on one of the supports under a heater. The heater rests directly on the capsule, its weight pressing the rubber stopper on the edges of the dish. Hot air from the heater passes through the sample and removes its moisture in from 4 to 8 minutes, the exact time depending on the fineness of the sand and the amount of water in it. When dry, the hot capsule and cover are placed on the pan of the balance. The point at which a line through its previous weight cuts the right hand edge of the pointer, indicates the moisture content in per cent. When several samples are to be examined, the heaters are charged in order. They can then be run at the rate of almost a sample a minute.

The apparatus has been giving excellent service in our foundry and in our laboratory for almost a year. Although it is not as accurate as the standard method of determining moisture, it is sufficiently so for practical control purposes and gives us the quick results that such service demands. We are hoping, that some one will improve on this apparatus by giving us an instrument somewhat like a pyrometer in design that can be thrust into the sand heap and will immediately indicate its moisture content.

R. B. Randall, who has been western sales manager for the Blaw-Knox Co., for approximately six years has been appointed western sales manager of the G. H. Williams Co., Erie, Pa., with headquarters at Chicago.

Seek Softness and Strength

British Quiz Scientist on Pearlitic Iron Properties

THE spread of scientific knowledge among foundrymen and the study of structure by the aid of the microscope have brought many valuable improvements to the production of cast iron. The interest shown on the subject of pearlitic cast iron has become worldwide and many advanced foundrymen and metallurgists are making a careful study of this form of iron. By their own experiments they are trying to ascertain its full possibilities. The results obtained by such investigations will be of great benefit to the industry in general by broadening the field of usefulness of cast iron. By the pearlitic process, it is sought to produce light and heavy castings with thin and thick sections having the same physical properties and using the same iron mixtures. Pearlitic iron has demonstrated that the study of structure is as important as chemical control. A product is sought which is the best possible compromise between strength and hardness.—The Editors.

AT A joint meeting of the Institute of British Foundrymen, Birmingham branch and the Birmingham Metallurgical society which was held at Birmingham Jan. 8 a lecture was delivered by Dr. S. G. Werner, Dusseldorf, president of the ironfounders of Germany. The subject of the lecture was pearlitic cast iron.

The lecturer, in discussing the Lanz method of producing pearlitic cast iron stated that it is possible to produce any casting including those of varying cross-sections with a perfect pearlitic structure. The interest in the subject is worldwide and many foundrymen have devoted careful study to it and have made many experiments on their own account. He believes pearlitic structure carries with it the highest qualities and therefore is deserving of attention. One of its chief values arises from the fact that graphite presents no difficulties. Instead of being in thick veins it ranges in fine lines in castings made by the Lanz process.

In the past foundrymen paid special attention to the chemical side of iron castings without devoting sufficient care to the structure, and in many instances a correct pearlitic casting was secured by accident rather than by any definite prearranged conditions. A compromise between strength and hardness is the ideal sought in gray iron. By the pearlitic method the foundryman can produce thin castings having the same qualities throughout as are being obtained in thick castings, according to Dr. Werner.

With regard to the mixture for pearlitic iron, the main thing is for the carbon and silicon combined to be 4 per cent. It is possible to tabulate the temperature of the molds for different sections. For example, cross sections ranging from ¾-inch to 2½-inch are heated from 150 to 350 degrees Cent. For a ¾-inch section, the total carbon and silicon should be higher than 4 per cent and the temperature of the mold lower. For a cross section ¼-inch thick, the total carbon and silicon should be 4.6 per cent and the mold heat 400 degrees Cent. A casting having cross sections of 3¼ inches may have a total carbon and silicon of less than 4 per cent, but if the carbon and silicon equal only 3.4 per cent the temperature of the mold should be 100 degrees Cent. higher than with the normal iron mixture.

A casting having a cross-section of 1¼ inches would require a mold temperature of 320 degrees Cent. and one of ⅝ inch section, a mold temperature of 500 degrees Cent. The 4 per cent standard of carbon and silicon may be taken as generally reliable.

Temperature Regulation Easy

The regulation of the temperature of the molds does not present any difficulty. The heating of the mold presents advantages, because the outer section of the casting is softer and consequently machining costs are reduced. The iron runs better, blowholes are avoided, and inner stresses are reduced, avoiding faults which in ordinary castings cause difficulty and a high percentage of bad castings. The brinell hardness can be kept below 200 and the decrease of the graphite largely increased thus aiding the ductility of pearlitic castings. The comparative tests made with an alternating impact machine show that the pearlitic structure increases the resistance to breakage by impact.

The lecturer stated that after he took up the pearlitic process and studied it he found they had to increase the capacity of their ovens for heating molds in proportion with the increased production.

Dr. Werner stated that one of the most important and interesting facts about pearlitic cast iron is that it does not *grow*. A report issued by Mr. Hurst on the testing of cast iron submitted to temperatures ranging from room temperatures up to 600 degrees Cent., confirmed those tests and led to the conclusion that to avoid the growth of cast iron when heated it was necessary to decrease the silicon in the iron. He submitted cast iron to temperatures ranging from 600 degrees Cent. to 1000 degrees Cent., and for that purpose used six different kinds of cast iron. The analysis did not vary to a large extent, but he obtained absolutely different results when they were submitted to different heats. In other words, the heating and cooling brought about considerable changes. The test bars were 4 inches long by ⅝ inch diameter. The first was submitted to heats of 6 hours at temperatures of 600, 700, 800, 900, and 1000 degrees Cent. After the different heats he measured the deflection. The same test bars were again heated to a temperature of 900 degrees Cent. cooled, and reheated a second time to that temperature. The different behavior of the test bars was illustrated by a curve. One bar of ordinary cast iron showed 4 per cent deformation at the first stage and 9.54 per cent at the second stage, whereas the pearlitic cast iron showed a deformation at the first stage of 0.72 per cent and for the second stage of 0.776 per cent.

In conclusion, the lecturer said there were still mysterious problems to be solved in connection with foundry operations, and the scientific investigator wanted the co-operation of the foundryman so that the fullest use may be made of his scientific researches.

In the discussion which followed the lecture, Prof. Thomas Turner, Birmingham university, said the lecture indicated some of the progress made in the knowledge of the structure and properties of cast iron in comparatively recent years.

Cast iron is much more trustworthy and valuable than formerly could be made.

Professor Turner further stated that he was interested to hear Dr. Werner speak of the suitability of a total of 4 per cent of silicon and carbon in the casting as he remembered that 40 years ago he made some experiments with silicon in cast iron, and found that the composition which gave the best results in a 1-inch section had about 2.2 per cent carbon and 1.8 per cent silicon, which added to exactly 4 per cent. They now understood the reason why they aimed at that proportion or its equivalent.

A. Marks, who followed Professor Turner, stated that for some time it had been recognized by metallurgists and foundrymen that structure was the essential feature in promoting strength and that the same structure could be obtained with varying compositions. Dr. Werner and his colleagues had been working on the same lines as he had followed in connection with the manufacture of diesel engines, and he regretted that he could not persuade the people most concerned to recognize the necessity of obtaining that pearlitic structure. It is an indisputable fact, he said, that the pearlitic structure gives strength throughout the various sections, but there was nothing in the lecture which had not been carried out experimentally on a large scale in British works.

Mr. Longden discussed the use of the term blowholes rather than shrinkage cavities. He was of the opinion that in gray iron, if they could get rid of the gases in the molds they would get perfectly sound castings. Mr. Longden inquired if the gases at a higher temperature would occupy as much volume as when suddenly heated from the lower temperature. The great esesntial in his opinion was to eliminate the gases.

E. Wilkinson recalled various experiments in foundry work with pearlitic structures but he thought they should have been pushed further and utilized more systematically. Six or seven years ago he made a considerable amount of gray iron in the electric furnace. The iron was subjected to an intense heat. Castings were poured at a high temperature, and the molds were taken out of the oven not more than 10 minutes before the metal was poured. Probably the temperature of the mold was as high as 450 degrees Cent. The metal was satisfactory and stood excellent impact tests. The amount of pearlitic in the structure was considerable although, he could not say it was entirely pearlitic. He thought that one of the points in getting pearlitic structure was to get slow cooling from the freezing point. In that way they would diminish the graphite and the cementite would be completely absorbed.

Dr. Werner replying to the several discussions stated that the character of pearlitic structure had been proved by the microscope. As to the term blowholes, in America they use the two terms, blowholes and shrinkage cavities, but in Germany blowholes meant shrinkage cavities. The pearlitic system decreases these cavities. It undoubtedly is sound judgment to cast iron as hot as possible in all cases.

As to the heating of the mold he explained that one method of drying and heating was to use preheated air at 80 pounds pressure which necessitated, closing the mold and driving the hot gases into it. The use of a pyrometer is essential and the mold temperature can be carried up to 500 degrees Cent. The same method is suitable for casting steel. Obviously, the reduction of the chill reduces the danger of castings cracking.

Rig for Production in Jobbing Foundry

BY JOHN DUFFY

UNDER the mistaken impression that unless at least 10 castings are ordered it does not pay to put a pattern on a jolt machine, many foundrymen daily pass up a source of profit. The impression is due to the usual method employed for mounting patterns on boards which is expensive and also involves the use of considerable space for storage while the patterns are not in use. To this must be added the time required for changing patterns on the machine. By adopting the following method a great deal of pattern expense may be eliminated and the foundrymen will find it advisable to mount nearly every pattern irrespective of whether the order calls for a single casting or for many castings.

Through co-operation with the pattern-shop nearly every pattern may be prepared for use with a machine. The main point to consider is that the joint line of the pattern must be at the widest part. Sand rammed on a jolt machine will not pack under projections. Where projections cannot be avoided they may be neutralized by adjusting a coreprint extending to the joint line. This idea is not revolutionary. Frequently it is practiced with patterns designed to be molded by hand in the usual manner either in the floor or in a flask. A joint preliminary examination of the drawing by the patternmaker and foundryman usually will suggest the proper construction to adopt before the pattern is started.

In the particular instance referred to we had two ½-inch steel plates prepared the full size of the machine table. One was bolted with countersunk bolts to the machine table. The other was kept in the pattern shop where it served as a templet. The machine was designed to ram cope and drag simultaneously and therefore a double set of holes was drilled in the form of a cross through each half of each plate. The plates were clamped together and drilled as a unit to insure accuracy of spacing. The center hole in each cross was tapped and threaded for the reception of a holding down bolt on large patterns. The remaining holes simply served as location holes for the dowel pins in the patterns. The pins in every case were made a tight fit and held the pattern firmly in place.

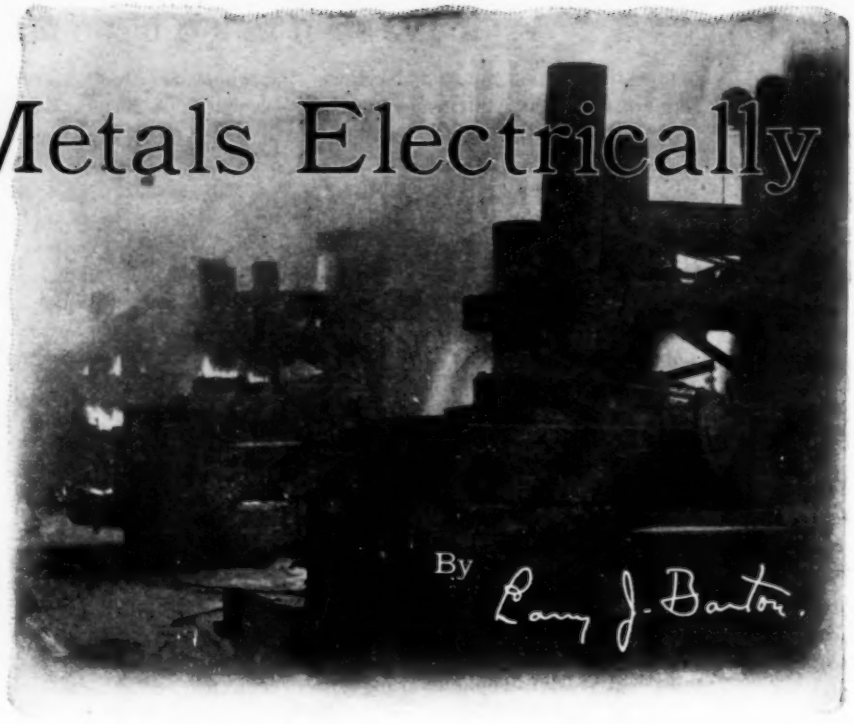
The location holes in the plate ranged from 1/10 to ½-inch diameter and by using different sized holes for the dowels the patternmaker could make the matter of locating the pattern fool proof.

In actual practice when a pattern comes into the foundry we know it has been designed for use with the machine because it has dowel pins in both halves. The operator removes the pattern already on the table of the machine and places the new pattern in place. The dowels are arranged in a distinctive manner so there is no danger of making a mistake in locating it on the plate. The mold can be bumped, rolled over and the pattern drawn in less time than sometimes is employed by a molder in hunting a rollover board.

Patterns formerly made to be molded in the usual manner may be changed to fit the machine in little time by an experienced man. Usually it is advisable to have one patternmaker attend all jobs of this kind. Familiarity develops speed, accuracy and reliability.

In addition to the rows of holes designed for locating the patterns, the steel plate also is provided with suitable pin holes for locating the flask parts in their proper position. In the event that the vibrator on the machine apparently has no effect, the condition may be remedied by drilling a hole on the under side of the pattern.

Refining Metals Electrically



Chapter IV (Concluded)

Manganese and Silicon Reactions — How Heat Treatment Helps

FROM time to time, various methods are advocated to reduce manganese from the slag back into the bath. Practically all of these methods have been tried by the author in an attempt to obtain white slags on heats containing manganese steel scrap, but all have proved unsuccessful. Such materials as aluminum, silicon, magnesium, etc., added to slags only raise the costs without any beneficial results. Only some carbonaceous material successfully will clear a slag from a manganese steel heat. Charcoal is too light and rides so high on the bath that its efficiency is low. Coal contains too much ash. The only material remaining is coke, and this should be as high grade as it is possible to obtain. Under no circumstances should coke sweepings be used in making manganese steel.

As mentioned earlier in this chapter, the influence of silicon on manganese is small. While this is true of steel made from a carbon steel base, with ferromanganese added, certain exceptions arise when remelting alloyed scrap. This was noticed first by the writer several years ago when in charge of the metallurgical work for one of the prominent manganese steel casting companies.

This phenomenon first was encountered when samples were being drilled for analysis by the chemist. He reported difficulty in obtaining samples by the usual method, that of using a special, high-speed drill, operated at slow speed with heavy pressure. On investigating, interesting facts were discovered.

Manganese steel, as ordinarily made, can be drilled easily by this special tool. It was found that the steel would suddenly get harder by progressive steps, over the course of several heats, until the climax was reached, when it would get soft again gradually. Steels at the one point could be drilled only with the greatest difficulty.

This hardness was found to be accidental, as it occurred only periodically. This rise and the subsequent fall lasted for two to three heats each way. An examination of the test bars showed patches of an iridescent color on the surface near the head, with all the colors of the spectrum, and having the appearance of a variegated rainbow. Other specimens would show spots of a silvery, whitish color. Soft steel bars would exhibit none of these properties.

Untreated bars when broken showed all classes of structure from a fine, soft, silky grain, up to the coarsely crystalline structure showing the familiar right angle appearance due to the effect of chilling on the manganese.

Test bars from these heats bent 180 degrees without any trace of cracking, but seemed to require a harder blow than usual. The main characteristics of this steel were great hardness, and a higher degree of stiffness. Test samples were polished and microphotographs taken. Two sets of these, with their attendant data are shown in Fig. 36 and 37. They show no unusual structure compared with ordinary steel samples examined.

Finishing Operations

MANGANESE steel castings as they come from the mold are glass hard and brittle. Heat treatment brings out the structure that gives the metal toughness. In this installment, the author gives the salient points in annealing, some valuable hints on making test drillings and in preparing and handling test specimens. He favors the bend test both as a progressive check on the metal in the furnace and as a final indication of quality. He also advises check tests on bend samples placed in the annealing furnace, to show the character of the annealing practice. In the forthcoming chapter, the first section of which will appear March 1, other special alloy steels will be discussed.

It was discovered that these hard tests always occurred on heats where shop scrap was remelted, and on the heats which were heated to high temperatures during reduction. Analysis showed silicons approximately 0.20 per cent higher than usual. While there was never any definite solution of this phenomenon it has always been the writer's opinion that this hardness was caused by some peculiar condition caused as a combination of this extra silicon reduction in the presence of unusually high temperatures.

Carbon steel of approximately the same analysis, and cast under the same conditions, generally will have the same structural appearance when a bar is fractured. This does not hold for manganese steel, the fractures cast under similar circumstances having a wide range of appearance. Some of these fractures are shown in Fig. 38, the sketches being taken from standard bend test bars, immediately after being broken under a steam hammer. All were cast in the same manner, being gated at the top, four bars being cast at one pour. The difference probably is due to varying temperatures at the time of pouring.

While the main activity of the metallurgist in a shop making carbon steel castings, is keeping the quality of the steel up to par, his main point of interest is in following the melting practice, together with miscellaneous testing, etc. However, in the manganese steel shop the actual making of the metal is one of the least of his worries. His trouble arises from heats of seemingly proper analysis, which crack during treating, or in the sand, which will not give a satisfactory bend test, or which exhibit some other peculiar phenomena.

Manganese steel, as it comes from the

TABLE XXXXII

Comparison of Recarburizers

		High grade coke	Low grade coke	Gas carbon pea size
Charges:	Shop scrap	....	958	1267
	Punchings	4760	4354	4379
	Turnings	813	523	553
	Ferromanganese	1020	926	923
Total		6620	6687	6860
Total poured		6351	6501	6673
Loss in pounds		269	186	187
Loss in per cent		3.5	2.6	2.6
Melting efficiency		96.5	97.4	97.4
Time of melting, per ton		1:13	1:14	1:135
Time of charging per ton		5.7	6.9	4.8
Kwhr. per ton of charge		925	830	850
STEEL:				
Preliminary carbon		0.08	0.13	0.21
Final carbon		1.16	1.02	1.06
Silicon		.47	.53	.30
Manganese		12.23	11.88	12.12
Manganese in total charge		13.10	13.40	13.50
Loss in points (0.01 per cent)		87	152	138
Loss in percentage of charge		6.65	11.35	10.20
Efficiency of ferromanganese		97.05	91.75	92.15
Manganese-carbon ratio		10.55	11.60	11.45

sand, is as brittle as the hardest white iron. Naturally, in this condition it will crack or check on the least provocation, and the greatest care must be exercised by all concerned until the castings have gone through the heat treating process.

After the castings have been cleaned they are loaded on brick topped cars, the top of the car forming the bottom of the annealing furnace. The usual practice is to have a load of castings of approximately uniform size and shape, that a more uniform heating of the entire batch may be obtained. As manganese steel cannot be finished by tools, grinding wheels are used exclusively, and the greatest of care must be exercised during the annealing operation. If the metal is heated too quickly there is a chance of these brittle castings cracking. If heated too slowly, the oxidation or scaling will be excessive, often allowing insufficient stock for finishing. If the heat is irregular in different parts of the furnace, some of the castings will warp, with attendant trouble when checking to final size and shape.

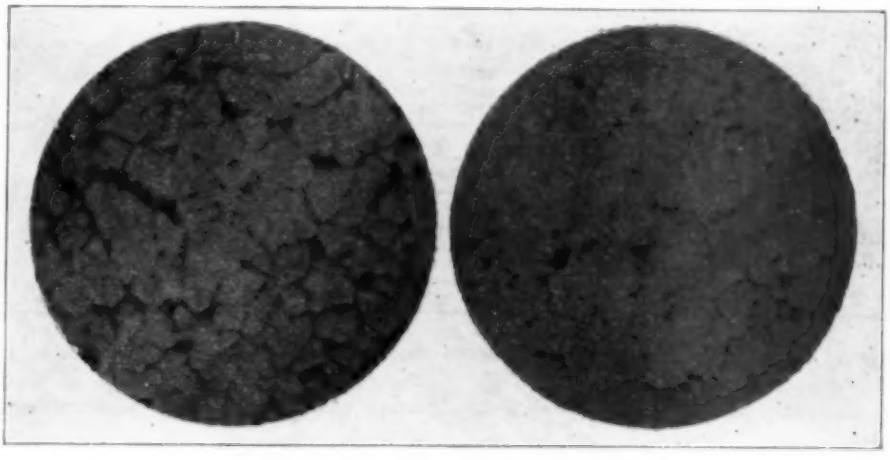


FIG. 37—BAR AS CAST AT LEFT AND AFTER ANNEALING AT RIGHT
Poured from metal containing Mn. 12.39 per cent, C, 1.02 per cent, with C, 0.18 per cent on the melt down. Bar bent 180 degrees on itself without checking

Formerly heat treating was performed either in oil or gas fired ovens of a special shape, so arranged that the flames used were soft and luminous, and so baffled that there was no chance of a direct impingement on the castings. This has been superseded in many shops by the electric treating furnace, which, has many advantages.

The furnace is heated slowly, in as much of a neutral atmosphere as possible, until a dark red predominates, when the heating may be increased to approximately 1800 degrees Fahr., when the furnace is so controlled that it is held at this point until the castings have absorbed this heat equally. The temperature then is raised to 1850 degrees, and the castings allowed to soak until the heat has been distributed uniformly through their mass, the time depending on the shape of the casting, and the thickness of section.

As soon as the heat has penetrated throughout, the car of castings is withdrawn from the furnace, and the castings dumped into water as cold as it is possible to obtain. This operation requires speed for the difference of a few seconds may result in improper quenching, especially on thin section work. Usually, the water is kept circulating. The quicker the castings enter the quench the better their quality. For this reason the cars often are arranged so that as they are withdrawn from the furnace, the body is raised, dumping the charge automatically into the quenching tank. This operation takes approximately five to ten seconds.

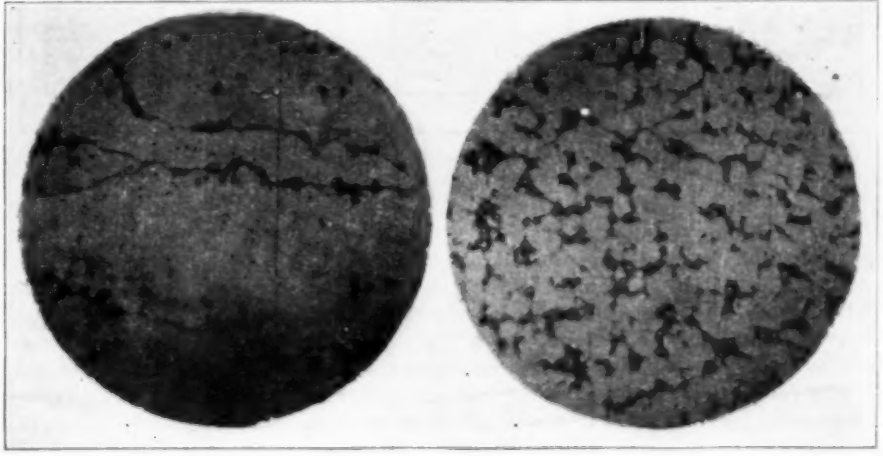


FIG. 36—BAR AS CAST AND AFTER HEAT TREATMENT
Poured from metal analysing Mn 12.50 per cent, C, 107 per cent with carbon 0.24 per cent on the melt down. Bar bent 180 degrees on itself without checking

After cooling, the castings are taken from the quenching tank. They now are toughened ready for final finishing and use. All finishing is done with grinding wheels.

On certain classes of work, inserts of cast iron or soft steel are used, being cast when the piece is poured. These find wide use for certain classes of work, especially hubs on sheaves or wheels,

TABLE XXXXIII

Thermal Efficiency of Furnace on Manganese Steel

Using following formula:

$$\frac{\text{Weight of steel in Kg.} \times \text{specific heat, latent heat of fusion}}{\text{Kw. Hr. used} \times \text{calories per Kw. Hr.}}$$

With 20 as latent heat of fusion; 470 as specific heat of steel; 600 as specific heat of basic slag; slag equals one-tenth of steel by weight; and 1 Kw. Hr. equals 860 calories. While 335 to 350 as specific heat for steel, and 535 for slag would probably have been more correct, the figures given were used due to the extreme temperatures to which the metal and slag are heated in pouring these heats for small sized castings. The following values were obtained:

	Per cent
Thermal efficiency of furnace	53.0
Total heat utilized in furnace	59.5
Total heat in steel	53.0
In slag	6.5
In cooling rings	2.55
Electrode holders	1.92
Transformers	1.23
Overcoming cold furnace, and radiation	34.70

Losses in cooling water on the roof rings, electrode holders, and transformers were obtained as follows:

	Degree C.
Water to transformer	19.8
To holders	22.5
From No. 1 holder	26.3
From No. 3 holder	27.3

Temperature could not be obtained on No. 2 holder due to a drain pipe being in the way.

	Degree C.
From No. 1 ring	31.2
From No. 2 ring	32.7
From No. 3 ring	32.9

No. 1 ring....1 liter water in 4½ sec., or 14 Kg. per min.
No. 2 ring....1 liter water in 4 sec., or 15 Kg. per min.
No. 3 ring....1 liter water in 4½ sec., or 14 Kg. per sec.

Total ..... 43 Kg. per min.

Transformer

(Temp. water to holders — temp. water to transformers) × total kilograms equals calories per min.

(22. —19.8) × 43 = 116 calories per min.

Holders

(Temp. from holders — temp. to holders) × kg. equals calories per min.

No. 1 (26.3 — 22.5) × 14 = 53 cal. per min.
No. 2 (averaged) = 60 cal. per min.
No. 3 (27.3 — 22:5) × 14 = 67 cal. per min.

Total .....180 cal. per min.

Rings

(Temp. from rings — temp. from holders) × kg. equals cal. per min.

No. 1 ring (31.2 — 26.3) x 14 = 69 cal. per min.
No. 2 ring (32.7 — 22.5) × 15 = 93 cal. per min.
No. 3 ring (32.9 — 27.3) × 14 = 78 cal. per min.

Total .....240 cal. per min.

Transformer: $\frac{116 \times 60}{860} = 8$ Kw. Hr.

Holders: $\frac{180 \times 60}{860} = 12$ Kw. Hr.

Rings: $\frac{240 \times 60}{860} = 16.6$ Kw. Hr.

Total .....36.6 Kw. Hr.

4000 amp. × 104 volts × 0.90 power factor × 1.73 650 Kw.

Summary

Transformer loss: $\frac{8}{650} = 1.23$ per cent

Holder loss: $\frac{12.5}{650} = 1.93$ per cent

Ring loss: $\frac{16.6}{650} = 2.53$ per cent

Total water loss .....5.70 per cent

where the wear is light, and this lower strength metal is suitable.

Manganese steel exhibits the same properties as cast iron when poured into chill molds, but instead of becoming brittle it is strengthened. A test bar from ¼ to ½ inch thick, when poured in a chill mold will give a bend similar to a bar treated and quenched. A similar specimen cast in sand probably will bend from 45 to 90 degrees, while a section of 3 inches poured in sand will be glass hard. However, after treatment, all three tests will show similar properties when bent. A great difference in structure may be obtained from different sand cast fractures, but after treatment all will have the soft, silky fracture, with great strength and toughness.

Difficulty in obtaining a uniform heat and quench limits the thickness of section which may be made of this metal. At the present time this maximum thickness is about 5 to 5½ inches. Heavier sections either are cored, or a carbon steel insert is placed in the center of the section, to act more or less as a solid core. This aids in relieving the great strains which would be caused by such a harsh quench as cold water when acting on a section of greater thickness. Manganese steel has such superior strength and toughness compared with ordinary metals, that sections of the maximum mentioned prove suitable for any class of work. This in itself is an important characteristic as it means great saving in weight of metal to fill a desired specification.

In the cast state, manganese steel is composed of austenite and free cementite. It is this proportion of cementite which gives it the brittleness associated with its cast condition. This proportion of cementite will either be smaller or larger, according to the proportion of chill during castings, the bend depending directly on this ratio. A piece chilled quickly will give a large degree of bend, on account of its low proportion of cementite, and *vice versa*. However, austenite as is well known, confers a high degree of toughness and resistance to wear to steels containing it in quantity, and the treatment of manganese steel is intended to change the structure of the metal to the condition where its entire structure is austenite.

In steels containing from 12 to 13 per cent manganese, the structure at temperatures higher than 1800 degrees, will be composed entirely of austenite. If the metal is allowed to cool slowly, this structure changes, due to this slow transition, and considerable cementite is formed. If the steel is heated again the structure will pass over into austenite at about 1800 degrees. The problem is to hold the carbides in solution as austenite, and the solution is to quench as rapidly as possible from temperatures above this critical point. If the steel is heated again past 700 degrees this austenitic structure will be destroyed.

This latter proves valuable in the recovery of manganese steel scrap, as the pieces, if of large dimension, have only to be heated to a good red, and allowed

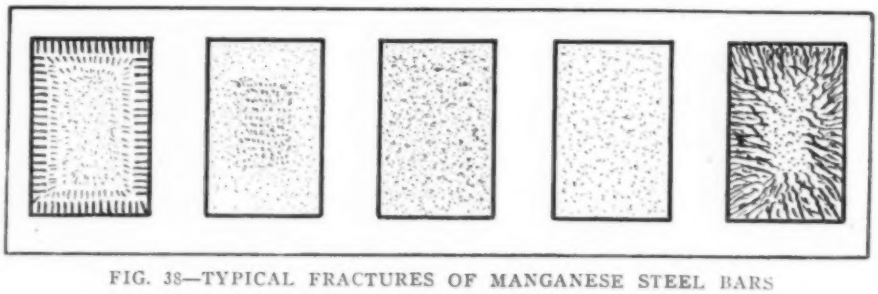


FIG. 38—TYPICAL FRACTURES OF MANGANESE STEEL BARS

to cool slowly in the furnace, when they can be broken as easily as cast iron, by a drop ball.

This steel has a greater shrinkage than ordinary carbons, the average being about 5/16 inch to the foot. Naturally, this adds to the molders difficulties, requiring larger shrink heads, and more care in placing gates and risers that there may be no binding during solidification, causing cracks and tears. This feature, coupled with the brittleness, requires a careful check on the design of the pattern, and results in many differences over ordinary steel practice.

It has been found through experience, that the point of greatest trouble is cracking of the castings, either immediately af-

TABLE XXXXIV

Heat Logs of Manganese Steel Melts Refining Metals

Twenty-five Per Cent Alloyed Shop Scrap

The charge was made up as follows:

	Pounds
Punchings, low carbon	4300
Turnings, clean	540
Shop returns	1200
Ferromanganese	889
Total	6929

The total poured was 6750 pounds, melting loss 2.5 per cent, time of heat, 3 hours and 45 minutes, and the current consumption was 725 kilowatt-hours per ton.

The analysis of metal was as follows:

	Per cent
Manganese	12.39
Carbon	1.02
Silicon	0.37
Phosphorus	0.063
Sulphur	0.010

The test bar bent 180 degrees without checking.

8:00 a. m.	Current on.
8:30	Electrodes raised, 200 pounds lime thrown in holes, and covered with fresh scrap.
10:30	Heat melted. Slag, a dark greenish brown. Fairly thin. Melt down carbon approximately 0.25 per cent. Slag given 25 lbs. of crushed ferrosilicon covered with 75 pounds of burned lime.
10:40	Metal getting hotter. Slag now a greyish brown. Given 25 pounds lime, and a heavy dusting of coke. Furnace sealed.
11:00	Slag a greenish white. Added 50 pounds lime and 20 pounds fluorspar. Another heavy dusting of coke. Furnace again sealed.
11:20	Slag light green, heavily basic. Manganese added.
11:30	Manganese all in furnace. Metal well rabbled. 25 pounds fluorspar added, and another heavy coke dusting. Slag a pea green.
11:35	Metal test shows bend of about 120 degrees without any trace of color on fracture. Metal hot. Slag a light green.
11:45	Metal perfect. Slag a greenish white, powdering slightly to a yellowish green powder. Heat poured.

This heat came down under perfect conditions, requiring little manipulation before being ready to pour.

Second Heat Containing 25 Per Cent of Alloyed Shop Scrap

The charge was made as follows:

	Pounds
Punchings	4000
Turnings	500
Shop scrap	1500
Ferromanganese	872
Total	6872

Analysis of steel:

	Per cent
Manganese	11.48
Carbon	1.06
Silicon	0.61
Phosphorus	0.080
Sulphur	0.014

The total poured 6700 pounds with a melting loss of 2.5 per cent. The time of heat was 3 hours and 30 minutes and kilowatt-hours per ton current consumption was 875. The bend test started checking at 140 degrees.

1:00 p. m.	Current on. 150 pounds lime added after a good sized pool had formed.
2:50	Heat all melted, but cold.
3:10	First metal test taken. Shows approximately 0.30 per cent carbon. Slag a medium green, with black patches. Gave a good dusting with gas coke, and added 150 pounds of lime mixed with 50 pounds spar. Gave another good heavy coke dusting, and sealed the furnace.
3:45	Heat fairly hot. Slag white and powdering. Consistency good. Began adding manganese.
4:00	Manganese all in. Slag a blue green. Gave 50 pounds lime, and dusted with 10 pounds finely crushed ferrosilicon. Gave a medium dusting of coke, and sealed furnace.
4:15	Metal test satisfactory. Slag light green. Temperature too low. Threw current at highest figure.
4:25	Metal in perfect pouring condition, and hot. Slag blue green. Added ferrosilicon at 0.35 per cent in lumps.
4:30	Poured heat.

Fifty Per Cent Alloyed Shop Returns

The charge was rattled free of scale and was made up as follows:

	Pounds
Punchings	2500
Turnings	484
Shop metal	2984
Ferromanganese	630
Total	6598

Analysis of metal:

	Per cent
Manganese	13.23
Carbon	1.30
Silicon	0.44
Phosphorus	0.079
Sulphur	0.007

The total poured was 6430 pounds, melting loss, 2.5 per cent and the bend test gave 180 degrees. The time of the heat was 3 hours and 30 minutes and the current consumption 812 kilowatt-hours per ton.

10:00	Current on. 50 pounds lime added as soon as first pool formed.
12:00	Heat all melted. Gave a dusting of coke, and added 200 pounds lime. Sealed furnace.
12:20	Slag blue. Metal appeared good, but was too high in manganese for any fracture estimate. Added 50 pounds lime and gave a very heavy coke dusting.
1:00	Metal getting rather hot. Slag a light blue. Heat coming down fine. Began adding manganese.
1:15	Manganese all in. Metal getting extremely hot. Metal test bends 90 degrees, but showing color. Added 25 pounds of lump ferrosilicon, dusted with coke, added 50 pounds lime and sealed furnace.
1:30	Metal test satisfactory. Slag a blue green. Metal hot. Poured heat.

Eighty Per Cent Alloyed Shop Returns

The charge was rattled until absolutely free of scale, and shiny. It contained the following:
60 lb. manganese ore on hearth.

	Pounds
Punchings	1000
Turnings	178
Shop metal	4665
Ferromanganese	324
Total	6167

Analysis of metal:

	Per cent
Manganese	12.14
Carbon	1.33
Silicon	0.50
Phosphorus	0.081
Sulphur	0.010

The total poured was 6010 pounds, melting loss 2.5 per cent. The bend test gave 140 degrees. Time of heat was 5 hours, 25 minutes and the current consumption was 833 kilowatt-hours per ton.

8:00 a. m.	Current on. As soon as pool had formed added 150 pounds of lime.
11:00	Heat all melted. Test taken and sent to chemist. Fracture on this test heavily colored with little bend before breaking. Slag green. Added 30 pounds of petroleum coke, and 50 lbs. lime. The coke started a heavy churning action causing good circulation of the slag. Doors sealed.
11:30	Chemist reports manganese, 8.88 per cent, and carbon, 0.93 per cent in metal. Slag approximately 20.0 per cent manganese. Slag a blue green. Gave a heavy dusting of coke mixed with lime and again sealed doors. Metal test taken here shows little bend, but contains less color.
12:00	Slag same green color. Metal heating up a little. Began adding manganese in 100-pound lot. Cut down current.
12:15	Manganese all in. Added 50 pounds lime, gave heavy coke dusting and sealed doors.
12:30	Test taken bends about 45 degrees, showing color. Sent to chemist for analysis.
1:00	Chemist reports manganese, 12.01 per cent, with carbon at 1.26 per cent. Bend test went 100 degrees with no color, although fracture was coarsely crystalline.
1:15	Bend test went over 120 degrees, showing a soft silky texture on fracture. Slag light green. Ferrosilicon added at 0.40 per cent. Furnace given another good coke dusting and ladle called for.
1:25	Heat poured.

ter pouring, or during the treating operation. The great majority of these failures have started from a sharp corner on the casting. Consequently all castings, as far as possible, are made with rounded corners. All right angled sections are filleted heavily, and brackets and *dogs* are used freely. All holes are cored, being made as small as about 1 inch. When smaller holes are required soft steel inserts are used.

Manganese steel, due to its high percentage of manganese, attacks ladle linings, causing considerable slag to form during the pouring of a heat. This must be watched carefully and skimmed or it will cause considerable trouble with defectives. On this account, tea-spout ladles find use in the majority of shops.

Due to the necessity of pouring the steel extremely hot, the sand required for molding must be highly refractory or cleaning costs will mount. This necessitates a sand of the highest quality, and cuts down the amount of old sand which may be used in a mix. Molding sand used on manganese steel generally will analyze higher than 92 per cent silica, with low percentages of iron or lime.

Testing Manganese Steel

As this metal cannot be touched by an ordinary drill, special methods must be employed to obtain drillings for chemical analysis. These are obtained by the use of a special shaped drill as shown in Fig. 39. A piece of high speed steel about 4 inches long, and 5/8 inch in diameter is heated up to a yellow and rapidly forged to the shape shown in *A*. This is then heated up to a white heat, and quickly quenched in kerosene, after which it is ground to the shape shown in *B*. This tool is used in a drill press having a slow speed, and allowing a heavy pressure to be used. Drillings can be made rapidly in this manner, usually coming off as pure white splinters, although there are times when the tool will bring off shavings several inches long. The author has drilled through a manganese steel plate 1 inch thick with such a tool. For the first half inch the tool went easily, but from there on great difficulty was had, the tool requiring constant resharpening. The last 1/8 inch was impossible to cut clean, the tool actually tearing its way through by pressure from the press.

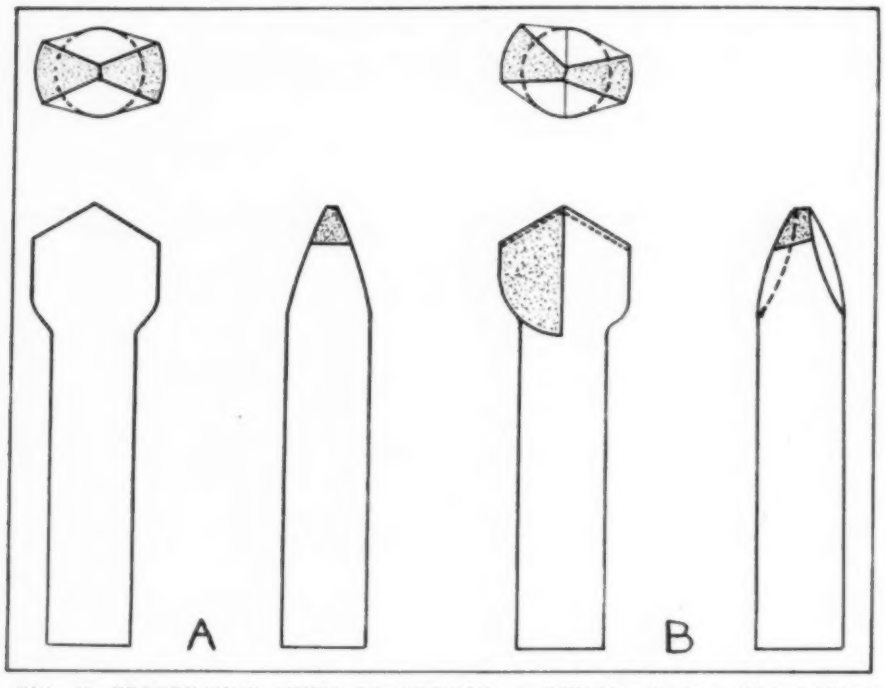


FIG. 39—PROGRESSIVE STEPS IN FORGING A SPECIAL DRILL FOR TAKING MANGANESE STEEL TEST SAMPLES

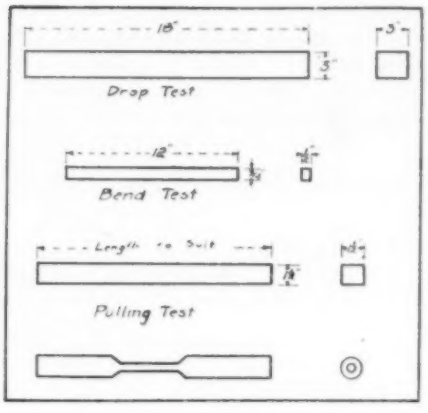


FIG. 40—TYPICAL BARS FOR DROP, BEND AND PULLING TESTS

The drillings are analyzed by the ordinary methods for manganese, carbon, silicon, phosphorus, and sulphur.

Three different bars, as shown in Fig. 40, are used for testing the physical properties. These are subjected to the drop test, the pulling test, or the bend test. The drop test is seldom used outside of rail work, but is made by placing the bar on two rigid supports, and dropping a hammer of known weight a specified distance, and noting the number of blows the bar will stand before

(*Concluded on Page* 160)

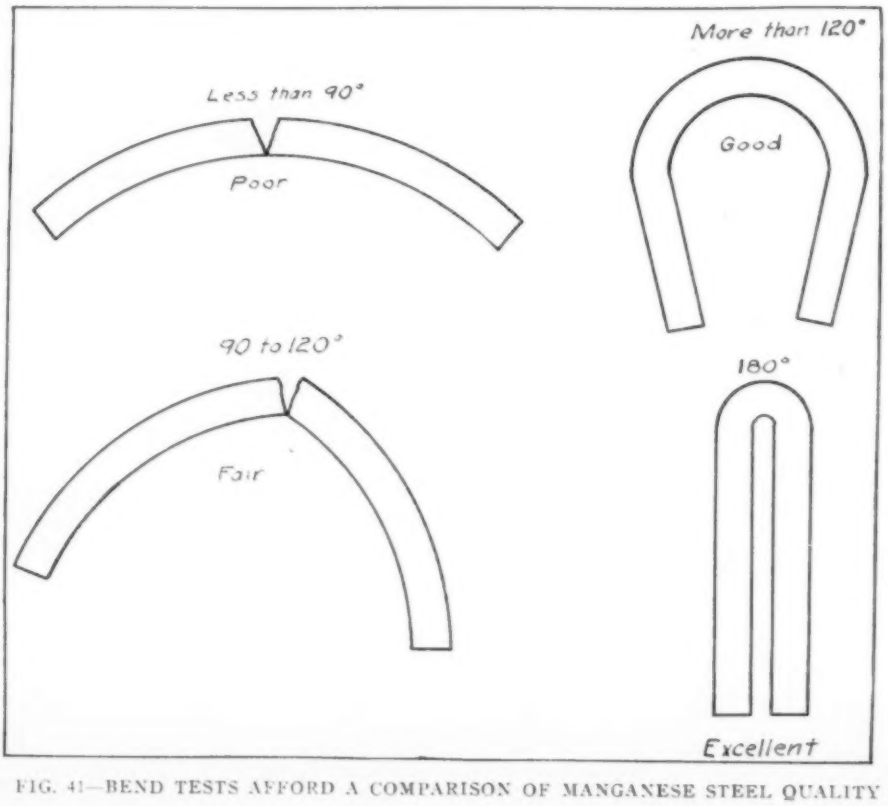


FIG. 41—BEND TESTS AFFORD A COMPARISON OF MANGANESE STEEL QUALITY

How and Why in Brass Founding

By Charles Vickers

Making Cast Iron Ingot Molds for Brass

We would like to have the analysis of a mixture of cast iron suitable for making pig beds for molten brass. A brass making concern is having trouble due to the beds breaking from the continual heating and cooling. If we could better their condition, it would mean a considerable increase in our business.

Cast iron for brass ingot molds should be soft and easily drilled. Suitable analyses are (1) silicon 2.15 per cent; sulphur .08 per cent; phosphorus 1.26 per cent; manganese .51 per cent; combined carbon .13 per cent and graphitic carbon 3.17 per cent; (2) silicon 2.40 to 2.03 per cent; sulphur .10 to .07 per cent; phosphorus 1.30 to .89 per cent; manganese .43 to 29 per cent; combined carbon .14 to 84 per cent; graphitic carbon 3.35 to 2.76 per cent.

The following analysis made molds that were *no good*. Silicon 3.30 per cent; sulphur .057 per cent; phosphorus .67 per cent; manganese .19 per cent; combined carbon .19 per cent; graphitic carbon 2.98 per cent. In the case of the latter analysis the silicon was too high and the phosphorus too low.

Dross Causes Porosity

Occasionally we receive a car load of lining metal, which, while apparently good chemically as far as the principal elements and amount of impurities are concerned, does not work well in lining. We are sending you a sample of this metal which you will note is honeycombed, particularly at the upper end, and resembles switzer cheese. This does not come from careless pouring, as the bearing was particularly well cleaned. Sometimes the porosity is not revealed until the lining is machined. The composition of the metal is 88.5 per cent lead, 5 per cent tin, 6 per cent antimony and other metals less than 0.5 per cent. Are there any tests we could give new metal before accepting it?

After making a careful inspection of the sample we are under the impression that the alloy has been made from incompletely refined antimonial lead, as the fractured surfaces reveal the presence of a large amount of dross or oxides. It is this dross that is responsible for the porosity at the upper end of the bar and which is caused by entanglement of air during the pouring. A simple way of testing a consignment of metal would be to melt enough to cast a strip which on being broken would reveal the presence of oxides. It should be noted if the metal ran with sufficient fluidity to avoid the air holes.

To prove that the presence of this dross is responsible for the difficulties encountered, make a small heat to specifications from all new metals, using soft ingot lead. The mere fact that the trouble is spasmodic shows it is caused by some abnormal condition of the alloy, and as the chemical analysis shows the composition is correct, it can only result from the presence of dross.

Bronze Bushings Spongy

We are having trouble making bronze bushings size 5½ x 3½ x 9 inches. We are using 88 per cent copper; 10 per cent tin and 2 per cent lead. We mix according to formula and the bushings come out spongy and honeycombed. We also pour from the same mixture, liners that are used for bearings. These castings are satisfactory and finish in excellent shape. We are at a loss to know just what is the matter and thought you might have some information bearing on this situation.

It is possible that we might have some information about the cause of the difficulty if we were able to visualize all the foundry practice involved in making the bushings and liners. Some day this may possibly be done by radio, but at present this is not possible.

We suggest that a careful study be made of the liners to discover just what is necessary to have them come good. Then apply the same methods to the bushings as to the liners and it follows the bushings will also be sound. It would be impossible for them to be otherwise.

However, this mixture 88-10-2 lead is a cranky one, and furthermore it has no special qualities to recommend it above other alloys. For some mysterious reason, it seems to be a favorite in the paper mill industry. Some bright genius long ago, imagined that zinc was a fatal impurity in bronze for paper mill castings, and substituted lead although there was no research work available to back up this theory. In fact, manganese bronze with 40 per cent zinc content is used to advantage in exposure to acids. The thing to do in this case is either to phosphorize the alloy or add 2 per cent of zinc.

Impurities in Castings Cause of Trouble

We occasionally produce castings that when machined are found covered with specks and cracks. The metal may be 90-10 or 85-5-5-5. The castings are in the shape of pots or bushings and are machined all over, then cut into rings. We use ingot brass, and run the heat up to 1750 and 1800 degrees Fahr. We wonder if the metal has been burned, or if there is any foreign substance present, for instance bismuth, which would cause the cracks. We submit a sample for your inspection.

The impurities in the metal responsible for the cracks and the specks are oxides. While bismuth when it runs over 1.5 per cent has a tendency to cause porous castings, it is not to blame in this case. Neither is antimony, judging merely from an inspection.

Such a condition could be produced only in the melting operation in the foundry by holding the metal at a high temperature without any covering for a long period, much longer than is usually done in brass foundry practice. Therefore it appears probable, the ingots are faulty. It is the practice of some producers of ingot brass to reduce the zinc content by oxidation by air, which is blown into the molten metal through an iron pipe pushed under the surface. This is a wasteful method owing to the loss of zinc entailed but that is not the only difficulty for the zinc oxide is retained in the metal to a large extent, and it has the effect shown in the sample casting sent for inspection. It is likely this is the cause of your difficulty, and it would be advisable to investigate the matter chemically and microscopically.

The metal will be freed from oxides to a considerable extent if it is brought to a high temperature in the furnace. The temperature you mention is far too low. Nothing but good can accrue to the brass by bringing it up to 2200 degrees Fahr. and keeping its surface well covered, in a crucible furnace by charcoal, and in oil-fired furnaces which blow away the charcoal by some good brass flux. Examples of these can be found in the advertising columns of The Foundry. It is not necessary to pour the castings at the high temperature the metal is brought to in the furnace as it can be easily cooled just before pouring. If possible stir it thoroughly before pulling the pot, and then add a little phosphor copper.

Bill Admires the Old Time Foundryman

BY PAT DWYER

LAST Wednesday afternoon about 2 p. m.—it might have been 2:15 I never notice the flight of time when I am busy—the advertising manager came in rubbing his hands. That is a bad sign. Whenever I see a man approaching and rubbing his hands, I feel instinctively that he is going to put something over on me. I favored him with about as sour a look as I could muster on short notice. I might have saved myself the trouble. Not that it really was any trouble, but you know what I mean. He tapped me confidentially on the spot where the top button of my coat would have reposed had I been wearing a coat and having hypnotized me properly with a view of his beautifully manicured index finger nail, he announced in the tone of one conferring a favor that he had placed my name on a program. Noting a lack of spontaneous enthusiasm on my part he continued to the effect that he had put me down on the program of the next meeting of the advertising association for a 5-minute talk on the inside dope on advertising.

That's these advertising lads all over. All pep! Let's go!

The committee meets in secret conference over an elaborate luncheon—somehow I have gathered the impression that committees always are eating—and calmly select a list of victims to furnish them a Roman holiday at the next regular meeting. *They* don't need to worry over the agony the victim endures in compiling a few impromptu remarks or the terrific ordeal through which he has to pass later in delivering these same remarks before a bored and highly critical audience. Stuffed with a seven-course luncheon and afterward leaning back puffing contentedly on two-for-a-quarter cigars, the audience is fortified and in a position to withstand almost anything for an hour or two. If they only could realize it the unfortunate speaker is more to be pitied than censored. He practically is empty.

Out of the fullness of the heart the mouth speaketh, but in my own limited experience I have noticed that a full stomach is not to be despised when a man has a little job of work on hand. The unfortunate speaker has had nothing to eat since noon. Nervous tension as the fatal moment approaches causes his stomach to contract like a deflated toy balloon and his meal is limited to a few nibbles of celery and a macaroon. Scanty provender, my masters to support either the body or the spirit. It it to be wondered that finally when his name is called, his mind is as void of ideas as his body is lacking in nourishment?

All these bitter reflections did not pass through my mind at the moment. Not likely. They did not have a chance. Immediately after breaking the glad news that I was to be the goat, my visitor presented me with one of the announcement cards of the association which outlined the program and also stated that a 5-minute talk amounted to about 600 words.

This item seemed to present a loophole. I promptly filed an objection, basing my claim on the perfectly logical basis that no living man could cover the subject, or any other subject in such a limited number of words.

I was told kindly, but withall pityingly to read the first book of Genesis where the creation of the world is described in less than 600 words. I was not prepared to dispute the statement. Some time has elapsed since I read the story, but I have a distinct recollection that at the barefoot age when I was forced to memorize the lesson it seemed to contain a great many more than 600 words.

For the moment I was rather stunned. Not because I inadvertently had overlooked this historic instance, but at the realization that my visitor apparently had such an intimate and comprehensive working knowledge of THE BOOK.

Up to that time I had labored under the mistaken impression, which of course I was happy to have corrected, that he confined his reading to *Printers Ink* and over due accounts with perhaps an occasional dip into *Snappy Stories* by way of relaxation—or inspiration.

A moment's reflection suggested another and less flattering theory. A witty Frenchman once said "When you have nothing to say, say it." The advertising manager may have had that idea in the back of his head when he extended the invitation. Also, I was somewhat consoled by the thought that a long winded speech not always is required to score a point or to convey a message. As a final argument I advanced the claim that I had no legitimate place on the program. I am neither an advertising man nor the son of an advertising man, and therefore, I said I was not competent to discuss advertising problems. That argument was brushed aside lightly as of no consequence. When the high powered and correctly tailored ambassador left my presence a few minutes later he had beaten down what I believe is known in inside

THE GREAT MAN GETS THE INSIDE DOPE

circles as *sales resistance* and—still speaking technically—had me sold on the proposition. I derived a small measure of consolation from the reflection that perhaps I was not the only one who was going to be sold.

That same night I drifted over to Bill's place and mentioned casually that I had been invited to address the advertising association.

"Well," said Bill, "You have my sympathy, if that will do you any good. I think the humane society should arrest those birds who insist on peaceable, law abiding citizens getting up to address crowds of perfect strangers. However, I will admit that the advertising fraternity is a highly important cog in the industrial and business machine. Without the aid and assistance of these dynamic gentlemen a great many of us probably would find ourselves out in the wilderness, existing on the light and not too nutritious diet of husks so feelingly referred to in the story of the prodigal son.

"You remember the tattered rapskallion who came sneaking home shivering in the winter time. The text does not state explicitly that this touching little episode happened in the winter, but surely in this free and enlightened country we are at liberty to draw a few inferences and do a modest bit of commentating on our own account.

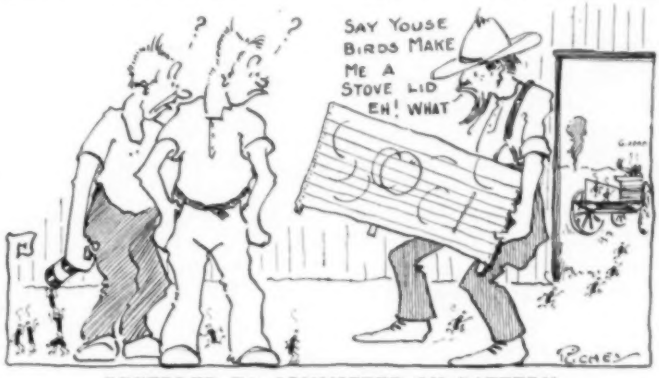
"From the context we learn that his father ran to meet him and fell on his grimy neck. That item might not satisfy some people, but in my mind it is sufficient evidence to support the contention that the ground was slippery—probably covered with ice. The old man simply skidded and fell on the scarecrow's neck. They did not have chains in those days.

"At various times I have heard learned commentators explaining the story and while none of these eminent torch bearers has seen fit to introduce the skidding theory, that is no proof his guess or explanation is any better than mine.

"With all due respect to the so-called high brow element of the population, an element which considers that it's bounden duty in life is to tell us poor, common worms where to head in at and where to get off and when and where we should do the aforesaid heading in and getting off, I think this element sometimes shoots over the mark and misses the finer inner meaning of passages that are perfectly clear to the proletariat. Witness the story of little Willie Jones. This is good. You might spill it kinda offhand in your talk.

"Just say casual like that you want to illustrate the anecdotal or dialog form of copy. When properly embellished with quotation marks and liberal spacing it is considered a knockout in inside circles among the boys who know.

" 'Willie,' admonished his mother, sternly—note, I did not say, *said* his mother, sternly. The word *said* is passe, taboo and is shunned like the plague by writers who are Oh! so different! 'Willie,' admonished his mother, sternly, 'what did you mean this morning when you put



REFERRED TO COMMITTEE ON PATTERN STANDARDIZATION

your thumb to your nose and wiggled all your fingers at deal little Algernon Chester?'

" 'Don't you worry, mother dear,' brisked Willie—there is a snappy little word for you, *brisked*—'Don't you worry mother dear,' brisked honest and truthful little Willie 'Algy knew what I meant all right, all right!'

"In this modern age we flatter ourselves that we either have invented everything worth inventing or that we have raised everything that has been invented to a higher state of perfection. A little calm reflection or a study of available records will cause any reasonable person to revise this opinion to a considerable extent. For example we think wireless telegraphy a modern and wonderful achievement. I will grant that in its present form it is modern and wonderful, but the system or principle of transmitting messages over long distances through the air is not new.

"Through an engineer who accompanied General Allenby into Jerusalem during the recent bickering, I learned that Pontius Pilate, one time governor of Judea, I believe on the Republican ticket, was a highly accomplished engineer and among other achievements perfected a system of communication with Rome through relays of polished bronze mirrors in the hands of operators stationed on the various hill tops between Rome and Jerusalem

"No great stretch of the imagination is required to see the honorable P. Pilate accompanied by his liveried chauffeur and footman driving down in the morning to his palatial suite of offices in the State House or in the First National Bank building, corner of Broad and Market streets He is relieved of his hat, coat and cane by three stalwart guards who retire noiselessly to make room for the private secretary with a boiled down and digested resume of the news from Rome on the preceding day. Inside stuff on the doings on Wall street, developments in oil lands and oil leases and other important information of that character.

"Advertising is considered, and justly considered, the most potent force or factor in modern business, but it is not new. With the possible exception of sky writing, every method has been tried before. Camels were better known among the ancients than they are in our day. Also they were more odoriferous, if that is possible and did not need advertising. Your nose knows. Coming right down to brass tacks, a phase lately resurrected by the advertising boys and paraded as something new, there is nothing new under the sun. That statement is not new either. Solomon used it more than 2000 years ago. I had occasion to pull a little stunt in the shop the other day which I had learned when I was a young lad serving my time. None of my men had seen it before and thought it was original.

"I served my time in a small general jobbing shop where practically all kinds of castings were made from small stove repair parts to castings weighing 5 tons. We had patterns for some of the stove parts, but usually the customer brought in an old wornout and warped fire pot, a grate with half of the bars gone or a fireback burned away in the center and twisted to the shape of an autumn leaf.

"We had real molders in those days who could take almost any old wreck, use it for a pattern to get the general outline and carve the remainder of the impression in the sand. In fact there was a tradition in the shop that one of the old molders once had made a fire pot for a customer who brought in a handful of ashes from the old pot to serve as a pattern. I cannot vouch for that story, it was before my time and while I should not care to attempt the job myself, still I have seen too many queer jobs made to say that was impossible.

"I remember one instance of a farmer who wanted a new stove cover. He knew nothing of foundry practice and besides he needed the lid on the stove until he secured the new one. He lifted the old lid from the stove and chalked the outline on the tail board of his cart. Then he replaced the lid and drove his cart down to the foundry. You can imagine the suprise he occasioned when he brought the tail board in to the shop.

He explained to the gaffer what he wanted. The gaffer turned the job over to one of the men and the son of the soil came back in the afternoon and got his cover. Service? I'll tell the world!

"The first job of the kind I had was carried out under the eye of an experienced master molder. The customer in this case brought in a stove back with the center burned out and with the ends cocked up about 2 inches higher than the center. The old casting was placed on a rollover board, concave side next the board, like any pattern and a drag was rammed and rolled over in the usual manner. A parting was made around the edge of the old casting and the sand in the center was slicked flush with the upper face in the same manner that the sand is slicked smooth to conform to the shape of any skeleton pattern. The cope was rammed and lifted off and the casting that served as a pattern was drawn out of the sand. The small island of sand which remained in the drag impression was removed to provide a space for the metal.

"After the mold was closed, a quantity of lead was placed in a long handled babbitt pot and melted in the foundry stove. On the theory that it was too hot and therefore would strain the mold, cause fins and make a general nuisance of itself, the metal was allowed to cool to a point where it barely scorched a long pine soldier. Then it was poured into the mold.

"The lead casting was taken from the sand and was chipped, cleaned and flattened out for a pattern. Of course, that was the primary object in making the lead casting so that it could be hammered into the proper shape. The flattening out process also added sufficient to the length to compensate for the natural contraction. The prepared lead pattern then was employed to make a mold in which the iron was poured for the customer's casting. I have had occasion to use the same idea on other jobs since that time where a hurry-up job, or a broken casting or no facilities for making a pattern was available."

"All that is quite interesting," I said. "But I don't see that the information is of any practical value to me under existing circumstances. What I want is sufficient material to keep me talking intelligently for 5 minutes on the subject of advertising."

"You are worrying unnecessarily," said Pill. "None of these lads will pay sufficient attention to know whether you are talking intelligently or simply talking through your hat. They only gather at these meetings to pass a social hour and they don't care what you talk about so long as you keep going. Five minutes after you are through no one will remember either who you are or what you said. However, be sure to tack a clever line on at the end. You easily can pinch it somewhere and the chances are ten to one that the audience will think it is your own."

"It is easy enough to talk of clever lines sitting here in a chair," I said, "but it is not so easy to think of one while standing on your feet facing a gang, one half of which wishes you would hurry and get through and the other half of which is paying no attention. Supposing you were in my place what would you say?"

"Why," said Bill lazily, "I should say that innumerable instances are on record to prove that the ancients fully appreciated the advantages of advertising. I would quote one instance to prove that they not only realized it's advantages but they also appreciated the value of using liberal space.

"For the benefit of those who are not familiar with the scriptures I would direct attention to the story of Sampson. He was the original strong man and was billed as a headliner at the local Palace theater. The manager of a competing theater bribed Sampson's lady friend Delilah to crab the act and so well did she do the dirty work that Sampson failed to get the hand or the number of encores to which he considered he was entitled.

"What did he do? I'll tell you what he did. He advertised. He had recourse to the greatest force in the world and his experience will stand for all time as the most outstanding testimonial to the efficacy of this medium. He took two columns and he brought down the house!"

Describes Sand Machine

The American Foundry Equipment Co., New York, has published an exceptionally attractive booklet devoted to the application of its sand cutting machine to foundries. The value of using machines to prepare molding sand is discussed and the various types of machines manufactured by this company are described thoroughly. Illustrations are plentiful and show the plants and offices of the company, views of assembly departments, the changes that have been made in the machine since 1908, the machine in operation in various plants preparing sand, and the types of machines.

Gives Information

The University of Tennessee, Knoxville, Tenn., has published a manual for engineers giving tables and other valuable information. The tables include the area of circles, squares and cubes, weights of metals in various shapes, trigometric functions, logarithms, standard screw threads, chimney sizes, earthwork tables, bending and shearing force due to different loads, electrical information, interest tables and other information. The price of the book is 75 cents.

A branch office of the Chicago Pneumatic Tool Co., New York, has been opened at Apartado 695, San Jaun de Letran, 15 Mexico City, D.F.

REPORT FROM SAMPSON'S TRAINING CAMP INDICATE THE CHAMP DOES A LIGHT WORKOUT EACH DAY

Brains or Tools—
Which Makes the Better Kit?

List Items Needed by Patternmaker in Caring for Most Jobs— Special Tools Constantly Being Introduced

BY WALTER C. EWALT

TOOLS used by the patternmaker have much in common with those used by the carpenter, cabinet maker, wood carver and wood turner. Tools of his own make numerous times are improvised to do certain jobs. However, little by little special tools are appearing on the market which are exceedingly convenient for the patternmaker, and also find use in other trades. It hardly is necessary to add that it is a good policy to buy the best tools that may be had.

There are about 11 different kinds of patternmaker's tools which may be divided into the following classifications: Cutting, pounding, chopping, boring, holding, scraping, sharpening, measuring, rubbing, bending, and cleaning.

If one looks over a dozen kits of tools used by as many different patternmakers, he will notice that while the majority of tools are alike in kind, in some cases, especially with respect to chisels and gouges, considerable difference in size and shape will be noted. This is true, because if the patternmaker were to purchase every kind of tool which would be most convenient for the endless variety of work which has to be done, the cost would be prohibitive and much hard work would be entailed in carrying the tools from place to place. The user should select the tools with which he can do the greatest variety of work with the least number of tools. A remark of an old patternmaker quite to the point was "Anyone could do a good job if he had good tools, but it takes a good man to do the job with poor tools." Of course he did not mean *poor* tools, but a minimum number of tools with which he could do good work.

It also has been said that "tools are half the trade." However, it is not possible for one to tell whether brains or tools are supreme as one seems to be as essential as the other. The medium by which all work in a mechanical line is done is tools, the variety being large.

Tools should be kept clean and in a certain place where they will be easy to find and within easy reach of the worker. If an apprentice early in his course devises a system of taking care of his tools, of having a regular place to keep his tools, he will save himself and his employer considerable time. Observation of a wood carver, who uses many varieties of carving tools, will show that he has a definite place for each tool after every operation, otherwise he would spend much of his time looking for tools.

Proficiency in the use of tools comes only with long practice. A recent national advertisement called attention to the construction of packing boxes, saying "It took a carpenter apprentice two years before he learned how to drive nails." The apprentice must observe the things going on about him and must ask questions pertaining to his work from the older men. He must learn to keep the tools sharp and the methods of keeping them in good condition. Sharp tools make possible faster and better work.

A list of tools which should be sufficient to care for any job given to the patternmaker is as follows:

Cutting Tools

Patternmaker's knife, 9/16 x 6½-inch blade.
Paring chisels, ⅛ to 2 inches with beveled edges and bent shanks.
Framing chisels, ½, ¾ and 1-inch.
Paring gouges, ⅛ to 1-inch with bent shanks and full sweep.
Firmer gouges, ¼, ½ and 1-inch with bevel on the outside.
Carving tools as follows: No. 7, 5/16-inch; No. 12, ⅜, 5/8 and 1-inch; No. 16, ⅛, ½ and 7/8-inch; No. 20, ⅛ and 5/8-inch; No. 21, ⅛, ⅜ and 7/8-inch; No. 25, ½ and ¾-inch; No. 27, 5/16 and ¾-inch; No. 28, ⅜ and 5/8-inch; No. 29, ⅛ and ¾-inch; No. 30, ⅛ and 1-inch; No. 31, ¼, ⅜, ½ and ¾-inch; No. 32, ⅛, ¼, ⅜ and ½-inch spoon.
Draw knife, 8-inch with folding handles.
Block plane 6 inches long.
Smoothing plane 9 inches long.
Jack plane 14 inches long.
Fore plane 18 inches long.
Rabbitt plane, right and left, each 4 inches long.
Sole plane with soles for 1½, 2, 3, 5 and 10-inch radius.
Corebox plane with additional sides to plane semicircles up to 10 inches.
Turning chisels, ⅛, ¼, ½, ¾, 1 and 1¼-inch wide, square cutting end.
Tooth plane iron for turning, ¾-inch wide.
Turning gouges, ⅜, ¾ and 1-inch.
Turning skew chisels, ¾-inch right and left.
Turning spear point, ¼ and ¾-inch.
Turning round point, ¼, ½ and 1-inch.
Corner rounding tool.
Router, 7½ inches long.
Spoke shaves, No. 1, 2 and 3 with bottoms rounded from front to back and from right to left. Also one straight bottom with take down handles.
Cross cut saw, 22 inches long, 8 teeth.
Dove tail saw 6 inches long.
Back saw 12 inches long.
Dowel sharpener, small type.

Pounding Tools

Claw hammer, 16 ounces.
Patternmaker's long peen hammer, ½-inch face.
Raw hide mallet.
Nail set.
Center punch.

Chopping Tools

Hatchet, 4-inch shingling.

Boring Tools

Auger bits ½ to 1-inch.
Expansion bits with four different sizes of cutters.
Bits, ¼ to 1-inch.
Twist drills, ⅛ to 3/8-inch.
Countersink.
Plug cutters, ⅜, ½ and 5/8-inch.

Holding Tools

Carpenters pinchers, 6-inch.
Pliers, flat nose, 6-inch.
Pinch dogs, one dozen each, ¾, 1, 1¾, 1½ and 2-inch.
C-clamps, 2½.
Rachet brace, 8-inch sweep.
Hand drill, 11¾-inch long.
Screw drivers for No. 4, 12 and 16 wood screws.
Magnetic brad set.
Bench vise.
Bench hook.
Miter box.
Clamps, one dozen each as follows:
No. 0 openings between jaws, 4 inches.
No. 1 openings between jaws, 6 inches.
No. 2 openings between jaws, 8 inches.
No. 3 openings between jaws, 10 inches.
No. 4 openings between jaws, 12 inches.
No. 5 openings between jaws, 14 inches.
Cabinet clamp, 48 inches long.
Saw clamp.
Saw horses.
Bench.

Scraping Tools

Files.
Rasps.
Steel scrapers for wood.
Steel scrapers for wax.

Sharpening Tools

Oil stone, soft, 8 x 2 x 1-inch.
Slip stones, two sizes, round edges as follows:

Length	Width	Back Thickness	Front Thickness
2¾	1¾	⅜	1/16
5½	2	½	¼

Leather strop.

Buffing wheel for lathe.
Buffing soap.
Oil can.
Abrasive wheel.

Measuring and Marking Tools

Slide caliper, 6-inch.
Square, 4-inch.
Rule, 6 inch.
Beam trammels.
Try square, 8 x 6-inch.
Depth gage, two sizes.
Scriber.
Scratch gage.
Combination set with 12 and 24-inch blade.
Steel shrink rule, 24 inches long, ⅛-inch shrink.
Steel shrink rule, 24 inches long, 3/16-inch shrink.
Steel shrink rule, 24 inches long, ¼-inch shrink.
Steel shrink rule, 24 inches long, 5/16-inch shrink.
Bevel, 6-inch.
Bevel, 12-inch.
Protractor.
Steel square, 2-foot.
Surface gage.
Outside calipers, 2½-inch.
Outside calipers, 5-inch.
Outside calipers, 8-inch.
Inside calipers, 2½-inch.
Inside calipers, 5-inch.
Inside calipers, 8-inch.
Outside transfer calipers, 6-inch.
Outside transfer calipers, 18-inch.
Inside transfer calipers, 18-inch.
Dividers, 3-inch.
Dividers, 6-inch.
Dividers, 9-inch
Beam trammels.
Hermaphrodite calipers, 4-inch.
Home made fillet gage made of 1/16-inch wood fiber, radii from ⅛ to 1½-inch.
Home made tool with center for placing one leg of dividers, the use of this tool will be explained in a later issue.
Folding rule, 2-foot.
Folding rule, 5-foot.
Winding sticks.

Rubbing Tools

Fillet tools, Nos. 1, 2 and 3.
Sand paper.
Side jointing stone for saws.

Bending Tools

Saw set.
Scraper burnishings.

Cleaning Tools

Bench brush.
Bellows.
File cards.

Mechanical Aids Handle Sand in Shop

(*Concluded from Page* 144)

arise constantly in the operation of the plant. The first room is designed and equipped with the necessary apparatus to pursue microscopic investigation, the second is the dark room where the negatives are developed and the third room is where the samples are polished and afterward stored. The windows are immovable, the temperature is controlled automatically, the air is washed and heated before it is blown into the room and the vitiated air is removed steadily to maintain a constant temperature and equilibrium.

Hollow metal benches in the various rooms of the laboratory are surmounted by black cararra glass tops and monel metal fittings. Solutions of many kinds employed in the work of the department are stored in suitable containers under the benches and are piped to special monel metal fittings in the glass back panels. Distilled water, gas, compressed air and electric current are handled in a similar manner through suitable fittings. A separate room has been set apart for the balances and a store room in the vicinity also houses the apparatus for preparing distilled water. The walls are finished in white tiles, hollow metal trim is used on the doors and windows and the floor is surfaced with a cement composition.

Manganese steel castings are annealed in three ovens, one heated by electric current, one heated by oil in the usual manner and a third recently completed, also heated by oil, but with the hearth and material rotating around a center instead of remaining stationary as in ordinary practice.

Castings Are Annealed

To those who may not be familiar with the metal it may be interesting to note that manganese steel is extremely hard and brittle when cast but becomes tough while retaining the greater part of its hardness after it has been heated to a temperature of 1000 degrees Cent. and then suddenly quenched in water. Analysis of the steel will show a manganese content of approximately 13 per cent, with carbon 1.25 per cent. Proper heat treatment will reduce the hardness from a brinell number ranging from 600 to 800 down to about 200. The tensile strength will be increased to over 100,000 pounds per square inch with an elongation of between 30 and 40 per cent in 2 inches and a reduction in area of more than 35 per cent.

The rotary annealing unit recently installed by Holcroft & Co., Detroit, has a capacity of 15 tons of small castings in 24 hours. It is designed to be operated continuously and in that manner effects economies in fuel consumption over the other two ovens which have to be opened and closed intermittently for the entry and removal of castings.

Castings are loaded by hand on the revolving hearth and when they have attained the proper temperature they are pulled through the door by an attendant armed with a long hook. The castings fall into a water tank, from which later they are raised by an inclined elevator and discharged into boxes mounted on trucks that take them to any desired part of the plant, or directly to the tumbling barrels. Large castings heated in the two larger ovens, one built by the company itself and the other by Electric Furnace Co., Salem, O., are cleaned in a sandblast chamber.

Pipes from all points where excessive dust is created are connected with a preliminary separator operated by a 25-horsepower motor. Heavy material is discharged directly from the separator to the refuse sand conveyor. The dust is blown through two cyclone dust collectors mounted on the roof and from there back to the refuse sand storage bin.

Refining Metals Electrically

(*Concluded from Page* 154)

rupture. As this bar is 3 inches thick the test is only useful on heavy sectioned work.

The pulling bar is standard size, and is tested for tensile strength, elongation, etc., in exactly the same manner as carbon steel.

Of all the tests, both chemicals, and physical, the bend test is by far the most important, and furnishes a better estimate of the quality of the steel than any other method. These bars are cast usually four to six in a flask, one set being made on each heat. One of these bars is drilled and the drillings used for chemical analysis. Two are sent to the testing department at once, heated in a small electric furnace to 1850 degrees Fahr., water quenched and bent. This bending serves as a check on the metal making department and is classified as shown in Fig. 41 as either excellent, good, fair or poor.

The remaining bars are treated in the annealing furnace with the castings from the same heat, and their bend is checked against those treated under perfect laboratory conditions. Any great difference shows poor annealing, and the annealing process must be repeated.

Formerly, when manganese steel was made in the converter, a bend of 120 degrees was considered excellent, but the electric furnace has increased the metal in quality to the point where a bend of 180 degrees is called for.

Manganese steel, although tough, and with great resistance to abrasion and shock has one disadvantage. It tends to spread or peen under pressure. The metal itself is soft, and with its great elongation rapidly flattens out under repeated pressure. This is due to its low elastic limit in proportion to other classes of steel.

This characteristic has been noted in ball mill liners, where the terrific peening action of the ore and ball charge often has welded together the manganese steel liners requiring the cutting torch to tear loose when repairing of the mill was necessary.

Philadelphia Foundrymen's Association *Begins Thirty-Fourth Year*

Howard Evans

C. R. Spare

CHARLES R. SPARE, metallurgical engineer and president of the American Manganese Bronze Co., was elected president of the Philadelphia Foundrymen's association, Inc., at the annual meeting held at the Manufacturer's club, Jan. 14. The American Manganese Bronze Co., one of the large producers of nonferrous castings in the country with a plant located at Holmesburg, a suburb of Philadelphia, has furnished bronze castings for a number of large engineering projects.

In July, 1891, a group of foundrymen met in Philadelphia and organized the Philadelphia Foundrymen's association to bring together those engaged in the casting of metals. The purpose of the association was to present papers, talks and pictures showing the latest developments in the foundry industry. At the first meeting, Howard Evans was elected secretary. For the past 33 years Mr. Evans has held that office and at the annual meeting last month was elected for his thirty-fourth term. He is one of the directors of the J. W. Paxson Co., Philadelphia.

At the meeting, Mr. Spare spoke on the outlook for nonferrous metals in 1925. He stated that the great wave of optimism and increasing confidence, which is sweeping the country, has resulted in increased industrial activity. The heavy and sustained demand for copper and other nonferrous metals during December has continued into this year. The foreign situation has improved steadily, while domestic demand is exceedingly encouraging. He said that not only has consumption increased considerably in fields in which copper, bronze and brass have dominated, but that extended uses for these alloys have been developed and researches now under way are searching for new applications of these metals. That 1925 will be a banner year for metals is predicted by Mr. Spare.

New Officers

PRESIDENT

C. R. SPARE
President, American Manganese Bronze Co.

VICE PRESIDENT

C. F. HOPKINS
Vice president, Ajax Metal Co.

TREASURER

W. G. SUMMERS
Assistant purchasing agent, Phoenix Iron Co.

SECRETARY

HOWARD EVANS
Director, J. W. Paxson Co.

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FRANK KRUG
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President, General Furnace Co.

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Purchasing Agent, Fletcher Works, Inc.

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H. M. GILES
General superintendent, Westinghouse Electric & Mfg. Co.

W. L. KALBACH
Patternmaker

J. F. HIGH
Sales, Air Reduction Sales Co.

R. E. BLAZO
Secretary, Reed Fears & Miller

TRUSTEES

C. R. SPARE

W. G. SUMMERS

HOWARD EVANS

FREDRICK M. DEVLIN
President, Philadelphia Hardware & Malleable Iron Co.

Mr. Evans told of many of the changes that have taken place in the foundry industry since he first became secretary of the association. Structural and pressed steel, brass and concrete have replaced iron in many instances, for example in columns, store fronts, hardware, parts of locomotives, freight and passenger cars, special machinery, motors, etc. Castings such as cast iron water pipe are being made in permanent molds of the centrifugal type, thus reducing the production of castings by casting in sand. However, new fields have been developed which compensate partly for the losses sustained.

Wages of the molders and coremakers have increased three or four times and the cost of raw material and transportation is higher. Iron castings now selling at from 6 to 10 cents per pound were only 1½ to 3 cents when the association first was started. The art of molding has improved wonderfully, as many large castings which formerly were made in loam now are made in green sand, and the molding machine has reached a high point in efficiency. These factors together with modern cranes and hoists, have assisted in keeping down the cost of castings. Much of this progress has been brought about through the work of organizations such as the American Foundrymen's association, which was established in 1896 under the auspices of the Philadelphia association.

Mr. Evans also discussed the effect of the war on the foundry industry. He told of the demands that were placed on the industry, of the additions that were made to plant capacities and of the heavy stocks that were left on hand at the close of the conflict. He also touched on general business conditions and predicted a prosperous year.

MAKE ABRASIVES From Crushed Iron and Steel

CRUSHED iron and steel commodities used in the foundry industry in this country 15 years ago did not exceed 200 tons annually. However since extensive improvements have been made in the design of cleaning equipment during this period, the volume of steel shot and grit used for abrasive purposes now totals several thousand tons a year. One producer alone ships over 7000 tons of the material annually

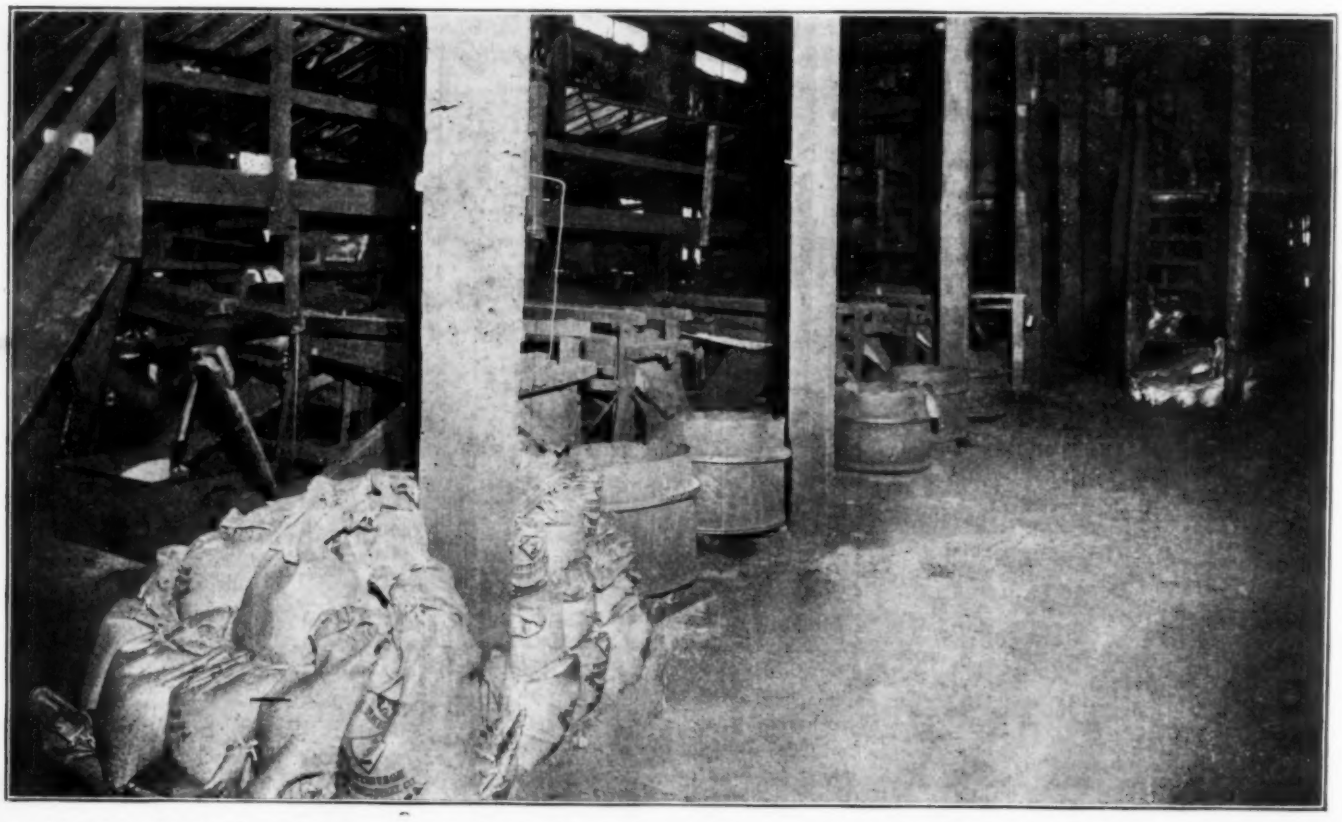
Crushed steel is made from high-carbon and crucible sheet steel. In preparing for commercial use the steel is given special treament in a furnace The treatment renders the steel brittle and in this condition the material is crushed by specially designed crushing equipment which is operated electrically The size of the material as it leaves the crusher ranges from 2 to 200 mesh. After screening into the various sizes, each batch is heat treated and then separated into 25 sizes ranging from 20 to 200 mesh. Sizes from 70 mesh upward are screened on silk bolting cloth, the finer sizes being employed for a variety of uses lying outside of the foundry industry.

A product known as steel shot, but which is a chilled cast iron, also finds extensive use in foundry practice In the process of manufacturing steel shot the highest grade of raw material is used, including selected scrap and charcoal iron. These are melted in a cupola which is equipped with numerous runners. During the casting period the metal is separated into small sperical globules by the action of high-pressure steam or heated compressed air directed against the stream of metal. In this manner the metal is blown into a tank of water and cooled. The shot, made brittle by the rapid cooling, is heat treated to impart a temper of hardness and then graded by mechanical means into 15 sizes which range from 4 down to 90 mesh.

The finer sizes are used principally as an abrasive for sand blasting purposes. The course material left on a 4 mesh screen is granulated by specially designed crushing equipment and in this form is known in trade parlance as angular steel grit. After the crushed material is heat treated to impart the qualities of toughness and durability, it is graded into 15 sizes from 7 to 100 mesh and then is ready for blasting castings, forgings, etc. Crushed steel, steel shot and angular steel grit are shipped in burlap bags holding 100 pounds

Synthetic Foundry Iron

Producing a good grade of foundry iron from steel scrap in the electric furnace has been demonstrated by work at the Northwest experiment station of the bureau of mines, Seattle, Wash. This development permits a manufacturing plant to use all its scrap in making castings. Improved methods of charging the 300-pound experimental furnace used at Seattle gave more rapid carburization, and a carbon content as high as 5 per cent was obtained. Several heats were made in a 1-ton electric furnace of the heroult type at Hoquiam, Wash., and in a 1-ton, indirect-arc, rocking furnace in a foundry at Detroit. These tests were successful in producing sound and strong gray iron from steel scrap and iron turnings.



SERIES OF VIBRATING SCREENS ARE USED TO SEPARATE ANGULAR STEEL GRIT INTO VARIOUS SIZES—THE PRODUCT IS SHIPPED IN BURLAP BAGS OF 100 POUNDS CAPACITY

He Rambled

While the RAMBLING Was Good

JAMES W. GIBNEY, works manager Bingham & Taylor, Buffalo, believes that whatever is worth doing is worth doing well. When he set out to become a journeyman molder he decided to become a real journeyman. How well his ambition has been realized may be inferred from the fact that with the exception of Siberia, Timbuctoo and a few more or less unimportant points in the interior of Asia and South America his wandering feet have carried him over the greater part of the world.

In all probability he eventually would have achieved a perfect score but just when he was going good he met a lady who decided he had been rambling around by himself long enough. Jim could hop a freight with the best of the gay cats, but he realized his limitations. He could not take a lady with him. He could not leave her so he did what man has been doing since the beginning. He compromised and left the road.

WHILE it is true that no direct evidence is available to support the contention, still I think we may assume that his middle initial *W* stands for wanderlust. In fact we even might go further and question the accuracy of the initials in the order in which they usually are set down. Logic would seem to indicate that instead of being *J. W.* they should read *W. J.*, the initials of another famous traveler the Wandering Jew.

Jim is rather reticent in regard to the date of his birth, but he modestly admits that he was born in Toronto on or about the year of the Big Wind in Ireland. To readers who are familiar with the most important historical events of the past century this information will be sufficiently explicit.

CHILD labor laws and amendments thereto were unknown in those days and at an extremely early age Jim started to learn the trade of pattern making in a shop operated by his father in connection with a small jobbing foundry.

Desire to see the world was aroused in the boy's mind from listening to wandering knights of the road who occasionally passed through the foundry. The same bump of common sense that has served him so well in later years, also was present when he was a boy. He reasoned that he could travel more expeditiously with a trowel and slicker in his pocket than he could toting a patternmaker's tool box. He promptly quit the pattern shop for the foundry.

When he was about 16 he decided he could afford to waste no more time. One night about the stroke of 12 he mounted to the hurricane deck of a box car for a life on the bounding rail. The box car traveled in a generally westerly direction, but it would have been equally satisfactory to our hero had it gone north, east or south. He did not know where he was going but he was on his way.

INCIDENTALLY he admits that his first real knowledge of freight car castings was gained from observation made while riding on the top, bottom, either end and occasionally the inside of these humble vehicles. Also he admits that as he never paid any fare his opinion and observation are unbiased.

He spent 8 years on the Pacific coast ranging from Sitka, Alaska to Callao, Peru and took a jaunt to the Sandwich Islands and Australia. When he could not get a job in a foundry he worked as a miner, sailor, rail roader, assistant to a surveyor or what have you. He was neither proud nor particular. Eventually he returned to the ancestral home and helped to pick the wishbone of the fatted calf, but when that little job was done he picked a rattler headed east and spent sceveral years working in many of the prominent foundries in the eastern and southern United States.

ABOUT this time he decided he had done his duty in seeing America first and hopped across the pond with the laudable intention of giving European foundries the once over. He remained there for some time and worked in several foundries in the British Isles and on the continent. A touch of home sickness brought him back to New York where he remained for a short time. From there he traveled west, but while located in Cincinnati, as hereinbefore stated, the little lad with the bow and arrow set the traffic signal at STOP, permanently.

In company with a couple of friends he opened an old foundry and operated it for some time, but about 20 years ago he sold his interest and moved to Buffalo where he assumed charge of the Bingham & Taylor foundry. He has remained with the company since and for several years has been works manager.

MR. GIBNEY has patented many appliances made by his company and used extensively by the railroad interests in this country. Also, he has invented and patented devices for use in connection with electric furnaces for melting iron and steel and for the manufacture of electro-chemicals. He has devoted special study and has met with gratifying success in developing rapid economical methods of melting iron in the cupola and electric furnace and has brought the art of making green sand cores for many of the intricate castings produced in the foundry to a high state of perfection.

The Shakeout

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DAN M. AVEY, Managing Editor
PAT DWYER, Engineering Editor
CHARLES VICKERS, Nonferrous Editor
GEORGE A. DRYSDALE, Metallurgical Editor
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¶ Orient Presents Market

PESSIMISTIC gentlemen who are inclined to worry greatly over a recently published statement that at the present rate of consumption all the high grade iron ore deposits will be exhausted in 70 years seem to forget or it may be they simply overlook the important fact that not a single one of them will be living when that time arrives.

Irrespective of their future destination we reasonably may assume it will be in a place where pig iron quotations are an unknown quantity. In the meantime they may derive a certain amount of comfort from another published despatch which states that the hill tribes from Mandalay to the Afghan border rapidly are adopting occidental habits and customs that involve the use of iron products.

Eastern potentates in China and India have had electric light plants installed for their own private use in palace and harem and outlying portions of the royal *demesne*. In accordance with customs of people from time immemorial, fashions inaugurated by the rulers or upper class of any country invariably have been taken up by the remainder of the people.

CONSIDERING the consuming capacity of the United States in the one item of electric lighting equipment alone and then remembering that the combined population of China and India is approximately seven times greater, it would appear that the future of the metal industry should be viewed with anything but either alarm or pessimism.

The touch of a button flashes a light off and on, but back of that touch lie the activities of a multitude of men and a myriad of production processes from the digging of the ore and its reduction in a blast furnace to the manufacture of the contents of the electrician's tool kit used in setting the button in place.

¶ To Standardize Is To Simplify

STANDARDIZATION has been one of the chief factors in bringing American foundry practice up to its present high state of efficiency. The outcome has lowered the cost of production and improved the product. To this end valuable work has been accomplished by the American Foundrymen's association and the American Society for Testing Materials through their various committees working separately and in conjunction with each other.

A BRANCH of science which has accumulated valuable information during the past few years is that which explains the true nature of cast iron and steel through the study of metallography and the fine art of photomicrography.

With all new sciences and subjects each investigator has his own ways and means of obtaining information and pursuing his research work. This in the end, leads to confusion. Valuable data thus obtained form the basis for controversy and misunderstanding.

THE only satisfactory remedy is that of standardization. The American Society of Testing Materials in its latest publication of standard specifications for 1924 has drawn up tentative standards governing the preparation of micrographs of metals and alloys including recommended practice for photography as applied to metallography. This will bring about a uniformity of results which will be more satisfactory to the investigator, more intelligent to the reader of technical papers and will simplify a complex subject.

¶ Castings Are Up in the Air

SIX years ago predictions were made that commercial aviation would show phenomenal growth, that a few years would see the country relying on thousands of air ships for fast passenger and freight transportation A few companies now are engaged in this occupation, perhaps 150 operating about 700 aircraft, but commercial aviation today has fallen far short of the postwar prophecy. The transcontinental air mail with its 36 hour schedule between San Francisco and New York, proved the possibilities of air transportation.

Why has the aviation program been pigeonholed? Why do Americans procrastinate while Europeans have commercial lines connecting the principal cities of the continent? Lack of demand for the service, reluctance on the part of the American public to invest money in the venture, and the lack of government support or subsidy are the chief reasons.

THE public needs to be educated in the advantages of this type of service. Fear that accompanies riding in airplanes must be overcome. This fear has been strengthened during the past two years because of accidents. However, little less could be expected since the commercial planes in use chiefly were surplus war stocks and gradually were worn out.

Most of this equipment now is out of commission and new must be manufactured before commercial aviation is started on the road to rapid progress. When the public is sufficiently interested, a new business opportunity should open for the foundryman, for planes like automobiles require castings in engines and mechanical parts.

Trade Outlook in the Foundry Industry

ALTHOUGH no causes are apparent, even to the most careful observers, the business activity which was expected with the advent of 1925 is delayed. A few of the major industries furnish notable exceptions to this condition. These include the steel-making, railway car building, constructional and pig iron producing industries. In the foundry field, activity is spotted and follows closely the fortunes of those major consuming sources which are the controlling factors. The shops which are dependent upon railway construction and replacement demand are busy. Building hardware foundries are active. A few jobbing specialty shops are fortunate in the volume of orders.

Auto Shops Stagnant

Manufacture of automobiles is at a low ebb. Passenger car builders confronted by an uncertain spring market, and with the lessons of the 1921 depression fresh in their minds are not stocking in advance of immediate requirements. In fact, at least two of the major manufacturers who do not make their own malleable castings have deferred their specifications for a month. December production of passenger cars registered a low figure of 182,023, the smallest monthly total for more than a year. This may be compared with the November figure of 284,939 and October's high mark of 335,041. Truck output has remained more nearly stable. The total number of trucks produced in December was 27,324, compared wtih 27,766 for November and 32,332 for October. The entire year of 1924 showed a total of passenger cars and trucks amounting to 3,564,000 which was a decline of 11 per cent from the total for 1923. These figures are given by the department of commerce. The total number of automobiles in service in the country is estimated as about 17,000,000 or one for each 6.6 persons.

Rail Prospect Is Bright

Much railway car and locomotive work is in prospect, as indicated both by current inquiry and by the continued high rate of railway operation. Freight loadings for the week ending Jan. 10 totaled 932,807 cars, which broke all records for the season of the year, according to the American Railway association. The week's total showed an increase of 167,080 cars over the previous week. The association estimates that the freight loadings for the first three months of the year will reach 11,844,000 cars, which will exceed all records for a similar period. Malleable and steel foundry operations are feeling the beneficial effects of railway activity. According to the department of commerce, a survey of 129 identical plants shows malleable foundries to be operating at 51.3 per cent of capacity during December, compared with 42.5 per cent in November and 43.9 per cent in October. The December rate is the highest since April, 1924. Orders booked in December were slightly greater than in October and were about 7 per cent ahead of November.

Pig Iron Rate Up

Another heavy increase, totaling about 400,000 tons was registered in January pig iron production totals according to the IRON TRADE REVIEW. The three million mark was passed for the first time in nine months and January had the highest total since last March. The production recorded for January was 3,369,425 gross tons, giving a gain of 413,036 tons over December, or an increase of 14 per cent. On a daily average basis, January produced 108,691 tons per day, while December showed 95,367 tons per day. The total of merchant iron produced in January was 666,628 tons, a gain of 31,902 tons over the preceding month. The daily average production of merchant iron in January was 21,504 tons, compared with 20,475 tons in December, giving a gain of 1029 tons per day. The total number of furnaces in blast on Jan. 31 was 251 or 61 per cent of the total number in the country. This is an increase of 22 stacks over the close of preceding month. Merchant furnaces in blast increased from 53 on December 31 to 61 on the last day of January. Eastern jobbing foundries are estimated to be operating at slightly beter than 50 per cent of capacity. Manufacturers of textile machinery are busy and gray iron foundries making special castings for this line are active. Demand for washing and ironing machinery castings is increasing. According to one gray iron jobbing shop, this class of work, together with lawnmower, and hardware castings has remained fairly steady during the past six months. Cast iron pipe demand is increasing both from municipal and private sources. Awards of steel for building construction are keeping up consistently and the outlook in all building lines is bright for 1925. The production of coal in December increased, and despite this fact the stocks on hand in industrial plants decreased.

Prices for Raw Materials for Foundry Use

CORRECTED TO FEB. 6

Iron		Scrap	
No. 2 foundry, Valley	$22.00 to 23.00	Heavy melting steel, Valley	$21.00 to 21.50
No. 2 southern, Birmingham	21.50 to 22.00	Heavy melting steel, Pitts.	20.50 to 21.00
No. 2 foundry, Chicago	24.00	Heavy melting steel, Chicago	17.50 to 18.00
No. 2 foundry, Philadelphia	24.76 to 25.13	Stove plate, Chicago	17.50 to 18.00
No. 2 foundry, Buffalo	23.00	No. 1 cast, Chicago	20.00 to 21.50
Basic, Valley	22.00	No. 1 cast, Philadelphia	19.50 to 20.50
Basic, Buffalo	22.50 to 23.00	No. 1 cast, Birmingham	17.00 to 17.50
Malleable, Chicago	24.00	No. 1 cast, Buffalo	18.00 to 18.50
Malleable, Buffalo	23.00	Car wheels, iron, Pittsburgh	21.00 to 21.50
Coke		Car wheels, iron, Chicago	20.00 to 20.50
Connellsville foundry, coke	$4.50 to 4.75	Railroad malleable, Chicago	19.25 to 19.75
Wise County foundry, coke	5.00 to 5.50	Agricultural, mal., Chicago	18.00 to 18.50
		Malleable, Buffalo	20.00 to 20.50

Nonferrous Operations

Brass foundries report slightly increased demand, although December was a comparatively slow month. In Ohio operations declined from 52 per cent in November to 49 per cent of capacity in December. New York nonferrous prices, according to the *Daily Metal Trade* of Jan. 6 follow: Casting copper, 14.25c; electrolytic copper, 14.75c; Straits tin, 57.87½c; lead, 9.50c to 9.75c; antimony, 28.00c; nickel, 38.00c; aluminum, No. 12 remelt, 22.50c to 23.00c. Zinc was 7.50c, E. St. Louis, Ill. New York prices for January follow:

New York Prices

Castings Copper	Electrolytic Copper	Lead	Tin Straits	Antimony	Aluminum 98-99	Zinc St. Louis
14.404	15.017	10.392	58.242	17.322	22.00	7.762

Comings and Goings of Foundrymen

LOUIS RASMUSSEN, formerly superintendent, has been made foundry manager of the Nash Motors Co., Kenosha, Wis., succeeding William H. Goldstine, who recently resigned. Mr. Rasmussen was born in Racine, Wis., and entered the foundry of S. Freeman & Sons, Racine, at the age of 12 years, serving his time in the coreroom, on the bench, side floor and under the crane. After serving his time, and on the suggestion of the foundry superintendent, John W. Dearsley, he traveled through the country for 9 years working in different foundries and familiarizing himself with various practices. He then became connected with the Racine Brass & Iron Co., Racine, and after 2 years became foundry superintendent of the J. I. Case Threshing Machine Co., Racine. Later he went to Manitowoc, Wis., where he built the Wisconsin Aluminum & Gray Iron Foundry, remaining as foundry superintendent for 2 years. This foundry made a specialty of automobile castings and at that time was one of the most modern plants for the making of automobile cylinders in that section of the state. He then became superintendent of the Simms Foundry Co., Racine, the plant being devoted to making gasoline engine castings. From there he went to Marinette, Wis., and built and managed the Northern Foundry Co. Several years later he became connected with the Nash Motors Co., as foundry superintendent. Mr. Rasmussen is a graduate of the McLain school.

LOUIS RASMUSSEN

D. H. Slonaker, vice president, National Roll & Foundry Co., Avonmore, Pa., is about to leave on a three months' business trip to Japan.

Otto Wartenweiler, consulting engineer of Los Angeles, has entered the firm of Smith-Emery Co., having charge of physical testing and mechanical engineering.

George Shields has been appointed general manager of the plant at New Brighton, Pa., of the Standard Sanitary Mfg. Co., Pittsburgh, succeeding William H. Garver.

Robert M. Catlin, eastern manager of mines of the New Jersey Zinc Co., was elected president of the Society of Mining and Metallurgical Engineers at their recent meeting.

James F. Twohy has been elected a vice president of the Pacific Car & Foundry Co., Seattle. He is secretary of Twohy Bros., railroad contractors, of Seattle and Portland, Oreg.

Robert D. McColl has been appointed manager of the Schenectady, N. Y., plant of the American Locomotive Co., succeeding John R. Magarvey, who has been appointed consulting vice president of the company.

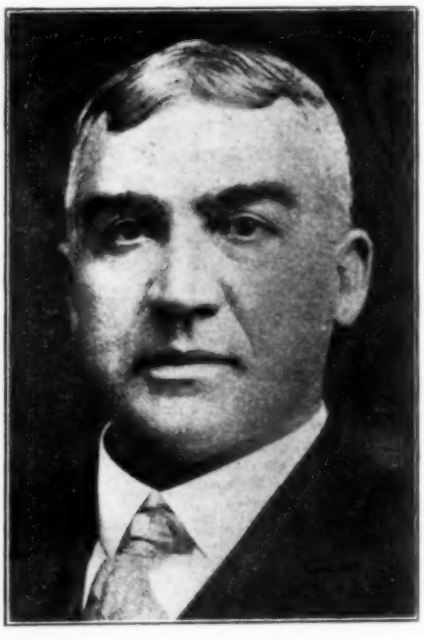
Henry Harnischfeger, president of the Harnischfeger Corp., until recently known as the Pawling & Harnischfeger Co., Milwaukee, left Jan. 27 for New York to sail on a Mediterranean cruise of six months.

A. W. Merkel has been appointed Superintendent of the new Birmingham plant of the Continental Gin Co., Atlanta, Ga. He was formely superintendent of the Atlanta plant. L. L. Perrine has been appointed superintendent of the Atlanta plant.

A. F. Fort, formerly connected with the Wabash Foundry Co., Wabash, Ind., has purchased the Paul Smith Brass Foundry, 564 W. Randolph street, Chicago. Mr. Fort will represent the Wabash Foundry Co. and also the Mid-West Foundry Co., Galesburg, Ill., in Chicago.

Paul E. Luther, who recently joined the Salamanca Foundry & Machine Works, Salamanca, N. Y., formerly was president of the Springfield Brass & Iron Foundry, Springfield, Vt. William M. Green, who also joined the Salamanca company formerly was with the Automatic Refrigerator Co., Hartford, Conn.

George E. Karl, chief mechanical engineer for the Wm. H. Nicholls Co., Brooklyn, and for many years identified with the foundry industry, has become associated with the American Radiator Co., 40 West Fortieth street, New York, as foundry equipment engineer. Prior to six years service with the Nicholls company for seven years, he was master mechanic and chief designer for the Dunham Co., Berea, O., which specialized in agricultural equipment and automotive castings. Prior to that, for seven years, he was plant superintendent of the Berkshire Mfg. Co., Cleveland, manufacturer of molding equipment.



GEORGE E. KARL

Charles Rapp, formerly with the Aetna Steel Casting Co., Cleveland, has gone into the florist business at Dayton, O. Mr. Rapp was foreman of the Farrell-Cheek Foundry Co., Sandusky, O., for 5 years, was with the Bay View Foundry Co., Sandusky, for one year and the Toledo Steel Casting Co., Toledo for eight years, was superintendent of the Weatherly Steel Casting Co., Weatherly, Pa., for four years and was with the Aetna Steel Castings Co. for three years.

Describes Car Wheels

Frederick K. Vial, vice president of the Griffin Wheel Co., Detroit, addressed the first meeting in 1925 of the Detroit

foundrymen's association on "The Chilled Iron Wheel, an Economic Factor in Railway Transportation." Mr. Vail described the early stages in the history of the railroads, from the days of scrap iron tracks to 130-pound rails, and from 5-ton cars to those designed for 120 tons. He explained the requirements for changing conditions and how chilled iron met these conditions from the standpoint of safety, cost, strength and service. He outlined several interesting results from research work carried out by the Griffin company and the Association of Chilled Iron Wheel Manufacturers to improve the product. He explained experiments conducted on the hot blast cupola, the savings made on coke and the uniformity of results obtained. Various grades of pig iron were discussed as well as advances made in cupola practice during recent years. The meeting had a record attendance.

Faked Foundry Facts

Blacking

Explains Foundry Work

Advantages of the use of a special iron were explained by G. A. Richardson, Bethlehem Steel Co., at the January meeting of the Quad-City Foundrymen's association held at the Rock Island club, Rock Island, Ill., Jan. 19. Mr. Richardson told of the special uses of the iron where close grain and tensile strength is desired. E. J. Lowery, Hickman-Williams Co., Chicago, spoke on "Factors in the Quality of Gray Iron." He discussed the effect of carbon on strength, machinability and soundness of castings. His talk was illustrated with lantern slides.

Death of Dr. Keith

Dr. Nathaniel Shepard Keith, widely known for his researches in electrometallurgy, died suddenly at his home in Philadelphia, Jan. 27, aged 86 years. He was born in Boston, July 14, 1838, receiving his education in Dover, N. H., and in New York. Early he became interested in mine development and went to Colorado in 1860, where he spent 9 years as a mining and metallurgical engineer.

Dr. Keith was a pioneer in electrometallurgy. The centrifugal electrical amalgamating machine, now in common use in extracting gold and silver from ore was his invention. He developed many other devices invaluable to metallurgists. In the early eighties, he became a member of the advisory staff of Thomas A. Edison, who was then organizing his first company. In 1884, Dr. Keith again went west, settling in San Francisco, where he built the first electric lighting plant in that city. Within the 10 years following, he manufactured electrical equipment adaptable to the mining industry, and also founded the *Electrical World*, of which he was first editor.

At the time of his death, Dr. Keith was secretary of the Victor Engineering Co., Bullitt building, Philadelphia; secretary and treasurer of the American Venture & Mines Corp. and was identified in one capacity or another with a number of other companies.

Plan New Foundry

Articles of incorporation have been filed by the Hoosier Foundry Co., Indianapolis, by Edward S. Workman, Gorgia Workman and Charles E. Hall, with a capital stock of $14,000. A general foundry and machine shop is planned.

Discuss Methods for Testing Pig Iron

At a recent meeting of the Association Technique de Fonderie, Professor Portevin reported on the activities of the commission which was organized for testing methods of pig iron. A discussion followed between Professor Portevin and Mr. Ronceray as to the advisability of maintaining the practice of shock tests. Mr. Portevin stated that these tests did not offer sufficient precision to be of any practical value, whereas Mr. Ronceray stated that only shock tests could give an idea of the manner in which castings will respond to shocks, since many pieces have to be scrapped owing to breakage through shock. It was decided that the commission would investigate any new method of shock-testing which might be presented to maintain the practice of this test. Professor Portevin also stated that the commission named to study methods of analysis of pig iron has prepared a brochure covering the work effected on this subect. This paper will be distributed to all members of the association. It was decided that the commission on methods of analysis of pig iron will ultimately be dissolved and replaced by another commission which will be in charge of studying methods of analysis of nonferrous metals. It also was decided that the commission which was named to study the subject of special grades of pig iron continue its investigations. Following the actvities of the recent congress in Paris in November, 1924, the committee of the association decided that it would be suitable to name two more commissions to investigate the subjects of the experimental study of sands and the standardization of patterns. It also was proposed that a commission should be named for the study of refractory products but this has put off momentarily, since Mr. Ronceray first wishes to organize a number of lectures on that subject. The first lecture was on the subject of "The General Study of Refractories," by Victor Bodin, director of the laboratory of the syndicate of manufacturers of ceramics in France.

Obituary

John A. Trenkamp, president of the Ohio Foundry Co., Cleveland, died Jan. 22.

William A O'Connor, for many years with the Hecla Iron Works, Brooklyn, N. Y., died at his home in Brooklyn, Jan. 25.

Opens Branch Plant

Hill & Griffith Co., Cincinnati, has opened an office and factory at 4606-10 West Sixteenth street, Chicago. Merrill Z. Fox is resident manager in charge of the branch and is assisted by Walter J. Adams, John H. Lyle and Peter Byrne.

Charles H. Ellis, who has represented Henry E. Pridmore, Inc., Chicago, in New York for many years has joined the staff of the Beardsley & Piper Co., Chicago, and will represent it in New York and New England.

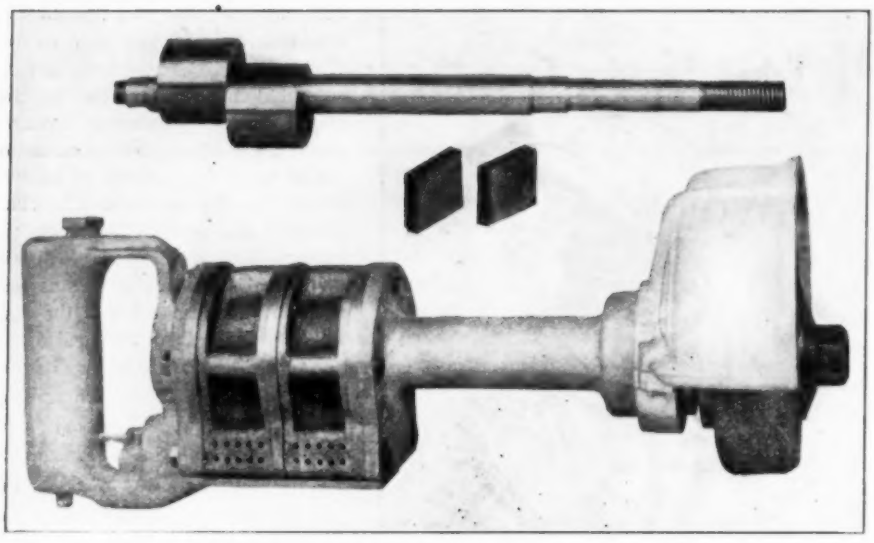


FIG. 1—ABOVE—THE THREE MOVING PARTS OF THE GRINDER—BELOW—COMPLETE GRINDER WITH SPADE HANDLE

Pneumatic Grinder Has Three Moving Parts

The Warner & Swasey Co., Cleveland, has developed a new line of pneumatic grinders whose source of power is a rotor mounted on a drive shaft with valve mechanism controlled by a sliding valve. A high degree of efficiency is claimed for this device since the design involves only three moving parts.

Air enters through the air inlet, a small portion of it being conducted upward to the air cushion chamber and is deflected downward exerting a constant pressure on the upper edges of the valve blades. This pressure gives a sealing effect between the eccentric surface of the rotor and the valve blade. The main part of the air entering the inlet rushes into the cylinder along the line indicated by the arrow in the accompanying diagram, causing the rotation of the rotor in a clockwise direction. When the rotor has revolved to the position shown in *A*, Fig. 2, the air moves upward to the exhaust chamber and is exhausted through the ports.

The rotors which revolve in their respective cylinders are mounted on the shaft directly opposite from each other, giving a balanced effect and an overlapping power stroke on each cylinder. The three moving parts of the tool are shown in Fig. 1. The blades are replaced by removing the cap at the top of the grinder cylinders and inserting new blades.

Clearance of from 2 to 3 thousandths of an inch is provided between the surface of the rotors and the cylinder walls. The clearance is sealed by a film of oil. Sufficient oil for an average day's run is held in a reservoir in the air inlet. The oil is fed into the cylinders as mist and is adjusted by a needle valve.

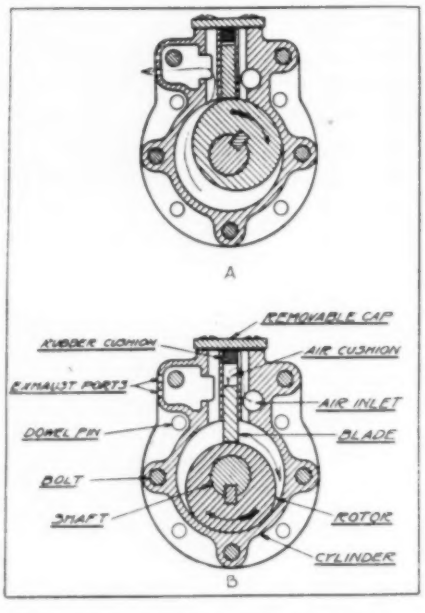


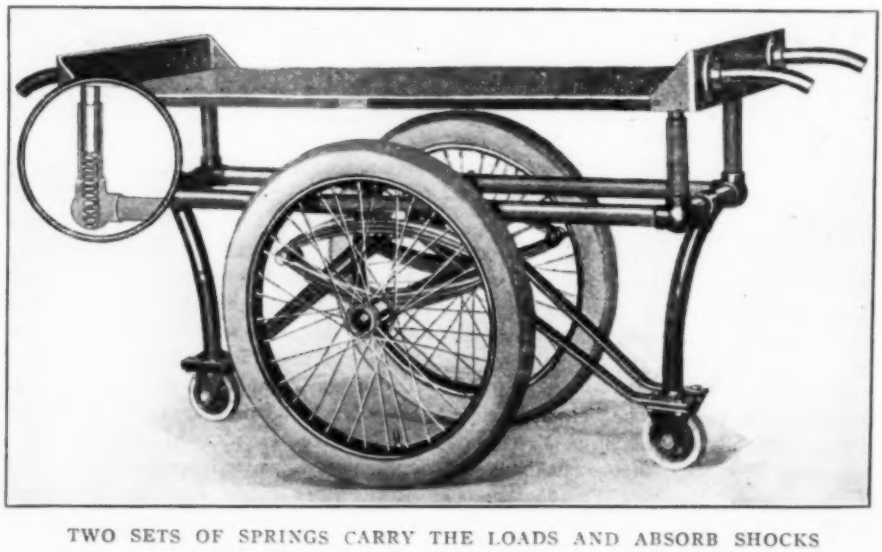
FIG. 2—ABOVE—POSITION OF ROTOR AND VALVE AT BEGINNING OF EXHAUST—BELOW—PARTS OF THE TOOL

Chrome nickel steel is used in the shafts and the handle and housing are made of aluminum. The grinders operate on an air pressure varying from 65 to 90 pounds per square inch with an air consumption of 32 to 40 cubic feet per minute. The grinder is made in several sizes. For general grinding a speed of 4500 revolutions per minute is used, for buffing, 6000 and for light grinding from 3500 to 7000 revolutions per minute.

Elliptical Springs Used on Core Truck

A truck for carrying cores, introduced by the Chicago Mfg. & Distributing Co., Chicago, is designed to prevent loss of cores through breakage. Large wire spoke wheels, 28 inches in diameter with standard 3 x 28-inch pneumatic tires, are used. The bearings are enclosed to keep out dirt and a felt washer retains the lubricant, which is introduced by a forced system. Rubber-tired guide wheels, mounted on ball bearings serve as a rest and keep the load level when in motion. Three-leaf, elliptical springs are used as the main load carrying support. Coil springs for carrying the lighter loads are encased in four upright standards on the chassis, extensions from the table top resting on the springs.

As the handles, by which the truck is operated, are attached to the top, the operator has control over the action of both the coil and elliptical springs. Strong rebound checks are attached from the axle to a cross piece connecting the two elliptical springs. The tray is steel and has a smooth surface so that the core trays will slide easily. The tray is 24 x 57 inches, the height unloaded 31 inches and the weight crated 225 pounds.



TWO SETS OF SPRINGS CARRY THE LOADS AND ABSORB SHOCKS

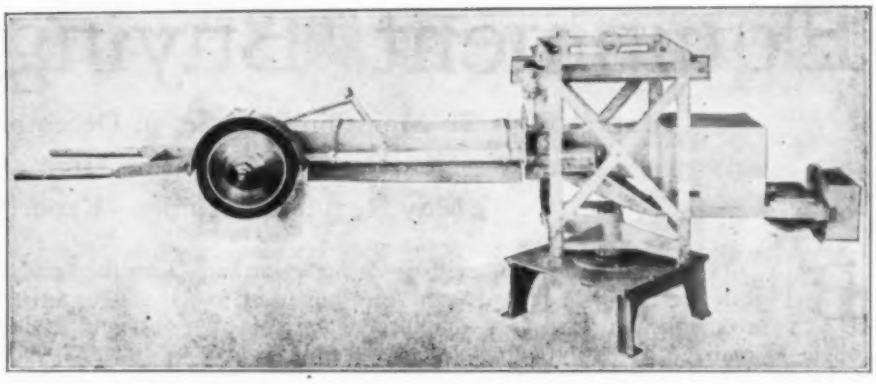
Collar May Be Split

The Link-Belt Co., Indianapolis, has developed a new collar designed to maintain the proper alignment of such equipment as pulleys, shaft bearings, hangers, etc. Strength, toughness and durability are claimed for the new malleable iron collar. The construction of the collar permits it to be split in two parts making installation and adjustment easy. However, the type collar may be furnished in the form of a solid ring. The product will be marketed through dealers located throughout the country.

COLLAR IS MADE OF MALLEABLE IRON

Designs New Grinder

The Farrell-Cheek Foundry Co., Sandusky, O., recently has placed a new type swing frame grinder on the market. This is designed for rough grinding and is to be used chiefly in iron and steel foundries and billet mills. The machine is portable, revolving on its base through a complete circle, and is equipped with roller bearings which are said to be dust proof. The grinding wheel is located outside of the bearing housing and is driven by a ball bearing motor. The motor, belt and starter are enclosed to exclude foreign matter. Forced lubrication is used throughout. Starting and stopping is effected through push buttons conveniently located.



MACHINE DESIGNED FOR ROUGH GRINDING IN STEEL FOUNDRIES

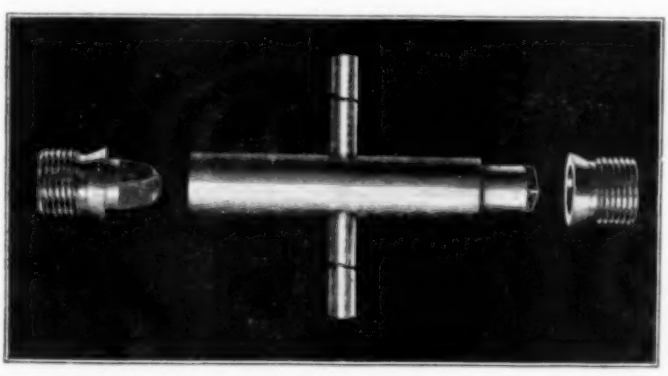
Develops Dowel Pin for Metal Patterns

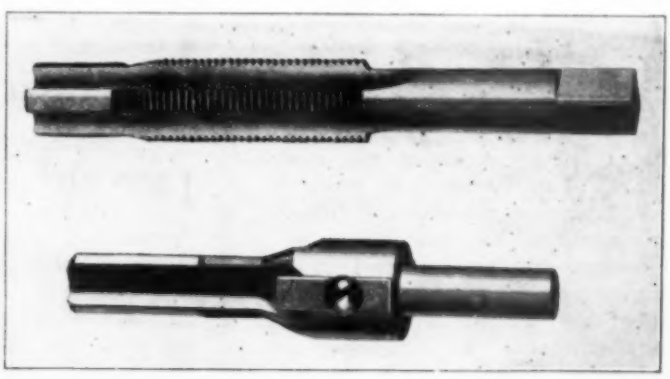
A dowel and dowel pin for wood patterns developed some time ago by the Kindt-Collins Co, Cleveland, has been followed by the production of a hardened steel dowel and dowel pin particularly adapted for metal patterns, coreboxes and dryers. The latest device recently placed on the market resembles its predecessor in its general features with the necessary modifications for application to metal. Both dowel and pin are threaded to conform to society of automotive engineers standard and are screwed into place with a double end wrench. One end of the wrench is finished square to fit into a corresponding recess in the hollow dowel. The opposite end of the wrench is provided with a square recess to fit over the square section of the pin.

Among the claims set forth by the makers for the dowel and pin, are that they are economical, easily applied and insure absolute accuracy over an indefinite period. A special set of tools including a counterbore, tap and wrench are furnished by the manufacturer for applying the device.

The two halves of the pattern or corebox are clamped together and a straight hole is drilled through both halves. The halves then are taken apart and the joint end of each hole is prepared for the reception of the dowels. The special counterbore is provided with a cutter which reams a tapered seat at the joint after the counterbore has descended a sufficient distance. The dowel is provided with a tapered seat or flange at the top which fits accurately into the prepared seat. The hole is then tapped with the special tap. If, in the course of time, the dowel works loose, a slight application of the wrench drives it further into the hole thus automatically tightening it without affecting its accuracy. Should it become necessary to change dowels on account of wear, the old dowels and bushing are unscrewed and new ones put in their place. No new holes are necessary.

The Hood Foundry Works, Inc., Charlotte, N. C., began operations Jan. 15. The new plant produces ornamental newel posts, panel tunnel rails, bronze castings, name plates, thresholds, etc. W. M. Hood is general manager and treasurer of the company and T. L. Talbert Jr. is vice president and secretary. The office of the firm is located at 407 South Church street.





THE DOWEL AND PIN TOGETHER WITH THE WRENCH ARE SHOWN TO THE LEFT. THE TAP IS SHOWN IN THE CENTER WITH THE SPECIAL REAMER AND COUNTERBORE ON THE RIGHT

Equipment Buying Slackens

Market Fails To Maintain Pace Set in December and First Part of January—New Projects Appearing Here and There Which May Require Machines—Exports Fall

BUYING of foundry equipment is being retarded slightly by factors which do not seem apparent to many manufacturers. The unexpected volume of business realized by many companies in December gave impetus to the market during the first part of January, but the turnover has not been entirely up to expectations during the past 30 days. Users of equipment appear to be waiting for further developments in the demand for castings before placing orders for equipment, which appears to be needed. That foundrymen are considering equipment seriously, either for expansion or replacement purposes, is indicated by the rate with which inquiries are developing. Another feature which seems to indicate that better than satisfactory buying is to follow is the diversity of equipment noted in the inquiries, the potential demand covering molding machines, sand handling and conditioning equipment, core and mold ovens, sand blast and other cleaning equipment, shakeout equipment, etc.

A number of new plants are being built or projected, including several in New England which have not progressed sufficiently to offer active inquiry for equipment, a new plant for the Standard Foundry Co., Racine, Wis., and a plant for C. Hauber, Chicago. The Oklahoma Steel Casting Co., Tulsa, Okla., has increased the capacity of the cleaning department and is to build a pattern shop. The Pioneer Coke & Chemical Co., St. Louis, is investigating the possibilities of steel castings production.

The value of foundry and molding equipment exported in December was $38,845 as compared with $39,617 in November.

New Inquiries Point To Future Buying

INQUIRIES for foundry equipment continue to develop slowly at Chicago. The National Engineering Co. has sold its sand mixers to the Milwaukee Steel Foundry Co. and the South Side Malleable Castings Co., Milwaukee; Superior Gas Engine Co., Springfield, O.; Vulcan Mold & Iron Co., Latrobe, Pa., and the Walter H. Prier Co., Marshalltown, Ia. The Badger Malleable & Mfg. Co., South Milwaukee, Wis., and the Belle City Malleable Iron Co., Racine, Wis., have purchased sand-blast mill equipment and the A. Y. McDonald Mfg. Co., Dubuque, Ia., has purchased a considerable amount of tumbling mill equipment from the W. W. Sly Mfg. Co., Cleveland. The Hercules Corp., Evansville, Ind., has ordered sand-blast and dust arrester equipment and the Nash Motors Co., Kenosha, Wis., has ordered sand-blast equipment from the Pangborn Corp., Hagerstown, Md. The Bedford Foundry & Machine Co., Bedford, Ind., has booked an order for a 10-ton electric overhead crane for the United Boiler, Heating & Foundry Co., Hammond, Ind. The Pioneer Coal & Coke Co., Syndicate Trust building, St. Louis, is interested in a foundry producing gray iron castings. This company, of which N. P. Withington is president and treasurer, is investigating the manufacture of steel castings and has expressed an interest in securing a convertor. A. A. Wickland, 5 South Wabash avenue, Chicago, is drawing plans for enlargement of the Standard Foundry Co., Racine, Wis. The present single gray iron cupola will be augmented by two more, an overhead crane with magnet will be installed in the scrap yard, and a new core room and new foundry building will be erected, at a total cost of about $250,000. The Standard Foundry Co. specializes on cylinder castings. Work will go ahead in about two months. The Wolff Mfg. Co., Chicago, has acquired a 2-story factory building at 2016 Carroll avenue, which formerly was used by the Monighan Machine Co. C. Hauber, 25 East Jackson, Chicago, has awarded a contract to Husak & Root for a 1-story foundry 50 x 60 feet with a steel stack 60 feet high, 20 inches diameter, which will be built on Fullerton avenue near North Robey street. The Oklahoma Steel Castings Co., Tulsa, Okla., has added a new cleaning room 50 x 100 feet which will be in operation shortly. New equipment has been added to the plant and a new pattern shop is to be erected at once. The Streator Foundry Co., Streator, Ill., subsidiary of the Wells H. Press Co., maker of washing machines, was seriously damaged by fire Jan. 29. The loss is estimated at $40,000.

Pittsburgh Sales Spasmodic

INQUIRIES for foundry equipment in Pittsburgh and vicinity are numerous but sales are spasmodic. The Herman Pneumatic Molding Machine Co., Zelienople, Pa., has received additional orders, including one for five machines for the Westinghouse Electric & Mfg. Co., Trafford City, Pa. The Sterling Steel Foundry Co., Braddock, Pa., which recently bought nine machines has ordered an additional one; the Michigan Steel Castings Co., Detroit, has ordered two more and the Weil-McLain Co., Michigan City, Ind., has added one to its order. The Lutz Co., Inc., Camden, N. J., the Arkansas Foundry Co., Little Rock, Ark., each ordered one and the Oklahoma Iron Works, Tulsa, Okla., sent in an order this week for a large roll-over machine. A large number of inquiries are pending before this molding machine builder and other sellers of this type of equipment and it is expected that a number of releases soon will come from car and radiator companies on machines under tentative orders. The Reading Steel Castings Co., Reading, Pa., probably will replace some equipment damaged recently when heavy snow caved in a roof. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has been purchasing some items against its first quarter list. A local foundry interest is inquiring for six 5-horsepower direct motor-driven emery grinders. Various foundries nearby and a few at greater distances have been purchasing ladles, vibrators, etc., and one or two including one at Erie, Pa., have bought chain slings, with chains and hooks. The Shoop Bronze Co., Tarenum, Pa., and the Vulcan Mold & Iron Corp., Latrobe, Pa., with a few other foundries, have been placing attractive flask orders. An Ohio foundry still is endeavoring to locate a good used cu-

pola. The Ohio City Sanitary Mfg. Co., Zelienople, Pa., is going ahead with its new addition and is purchasing different kinds of equipment including a cupola and a blower. Another proposition is up here involving the purchase of three cupolas, two blowers, crane ladles, etc. The United Engineering & Foundry Co., Pittsburgh,, wants a sand mixer and the Lewis Foundry & Machine Co., Pittsburgh, is in the market for a 10-ton geared crane ladle. Crane inquiries are fair and from time to time a crane sale to a foundry is noted. The Vulcan Mold & Iron Corp., Latrobe, Pa., recently placed a crane with the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. The General Electric Co. placed an order for three cranes for its Cincinnati plant with the Northern Engineering Works, Detroit.

Cleveland Buyers Wait

SALES of foundry equipment in the Cleveland territory declined slightly in the latter half of January and the forepart of February, as compared with sales in December and the first half of January. Some feel that this condition is only temporary and that business for the first half of the year should be better than in the corresponding period of 1924. Men of the industry base this prediction on the interest that has been taken in various lines of equipment since the first of the year, and in inquiries now extant. Lists are being introduced in a good volume, and every indication points to an early closing on many items. The Ferro Machine & Foundry Co., Cleveland, has purchased five double end electric rolling drawer type ovens from the F. A. Coleman Co., Cleveland. The Light Alloys Co., Painesville, O., has closed on a sand mixing machine with the Standard Sand & Machine Co., Cleveland. The Packard Motor Car Co., Detroit, the H. Wetter Mfg. Co., South Pittsburgh, Tenn., the Dixie Foundry Co., and the Hardwick Stove Co., both of Cleveland, Tenn., and the Forest City Foundry & Mfg. Co., Cleveland, have purchased tumbling mill equipment from the W. W. Sly Mfg. Co., Cleveland. The Draper Corp., Hopesdale, Mass., has closed on a continuous tumbling mill and necessary dust arrester equipment from the Sly company. Shakeout bails have been purchased by the Metters, Ltd., Sydney, Australia, and vibrators and shakeout equipment by the Sanitary Mfg. Co., Louisville, Ky., the Ohio Malleable Iron Co., Columbus, O., the Griffin Wheel Co., Kansas City, Kans., the New York Air Brake Co., Watertown, N. Y., the Ferro Machine & Foundry Co., Cleveland, the American Steel Foundries, East St. Louis, Ill., and the Pullman Car & Mfg. Co., Pullman, Ill., from the Stoney Foundry Engineering & Equipment Co., Cleveland. Through error, a sale of shakeout equipment by the Stoney Foundry Engineering & Equipment Co. to the Great Lakes Engineering Co., Detroit was listed in the Feb. 1 issue. The equipment was purchased by the Great Lakes Foundry Co., Port Huron, Mich. The Packard Motor Car Co. has secured sand-blast equipment from the Pangborn Corp., Hagerstown, Md., while the Continental Gin Co., Birmingham, Ala., has purchased dust arrester equipment from the same company. The Highland Park Die Casting Co., Detroit, expects to double its plant capacity within a year.

New York Market Brightens

WHILE still far from brisk, trading in the eastern foundry equipment field is showing a trifle more life. Few large orders are noted, but inquiry is somewhat better and awards are a little more numerous. Most sellers believe the current month will show a substantial improvement over January, notwithstanding the fact that it will be a shorter month by three business days. A tendency toward increased melting capacity is seen in recent buying of cupolas. One large seller in this district has booked orders for six within the past fortnight. Four of these have a capacity of 22 to 24 tons per hour, and are for the United States Cast Iron Pipe & Foundry Co. While the order was placed through the Burlington, N. J., offices, it is believed that the cupolas are for several of the company's plants. Other buyers of cupolas include the Federal Foundry Co., Garwood, N. J., and the International Heater Co., Utica, N. Y. A recent buyer of equipment is the Campbell Foundry Co., Harrison, N. J., which closed on a 5-ton electric crane, with 28-foot span, to the Chesapeake Iron Works. The Eastern Malleable Iron Co., Naugatuck, Conn., also closed on a 5-ton crane, the order to going to an unnamed builder. The National Radiator Co., Johnstown, Pa., purchased a 2-ton crane for its Trenton, N. J., plant to the Shaw Electric Crane Co., Muskegon, Mich. Buying of equipment may have been delayed by heavy snows in this section, which have delayed shipment of foundry products.

New England Market Slow

FOUNDRY equipment is not moving in New England at anything like the pace expected earlier in the year. Inquiry has shown a healthy improvement but orders appear slow to materialize. Some encouragement is found in the fact that one manufacturer of flasks has received orders at double the rate of the 1924 average. Molding machines have been in moderate demand, a fair number of units being placed since the first of the year. Recent sales of molding machines and some other equipment are reported to Gilbert & Barker Mfg. Co., Springfield, Mass., Scott & Williams Inc., Laconia, N. H., and the Walworth Mfg. Co., South Boston. The Henry Perkins Co., East Bridgewater, Mass., has purchesed a sand separator as has the H. B. Smith Co., Westfield, Mass., from the Royer Foundry & Machine Co., Wilkes-Barre, Pa. A manufacturer of cranes reports three moderate sized crane sales to New England foundries since the middle of January. A Connecticut foundry is in the market for an annealing oven, and some compressor installations are in prospect in both Connecticut and Massachusetts. The Easter Malleable Iron Co. is building a new plant at New Britain, Conn. which will contain an annealing room, a soft rolling room and a sorting and shipping department. Considerable equipment will be required in this connection. A fair amount of other new construction is in prospect in New England, but is not at a stage to make equipment inquiry active.

Made Purchasing Agent

L. T. Miller has been appointed purchasing agent of the Detroit Steel Products Co., Detroit, succeeding T. F. Thornton, who recently resigned to become president of the Roehm Steel Rolling Mills, Detroit. Mr. Miller formerly was purchasing agent of the Chevrolet Motor Car Co., and prior to that was connected with Continental Motors, Inc., Detroit, and the Elgin Motor Car Co., Elgin, Ill.

Takes Over Property

The Meriden Foster Merriam Co., Meriden, Conn., has taken over the property and assets of Foster Merriam & Co., which was founded in 1835. The company manufactures gray iron, brass, bronze and aluminum castings, furniture trimmings and metal specialties. Howard E. Boardman is president and treasurer.

Appointed Representative

J. W. Lytton has been appointed special factory representative of the Swartwout Co., Cleveland, to make recommendations covering the use of high pressure bucket type, low pressure float type, return traps, oil and steam and air separators and feed water heaters.

The Bri-Veil Brass Mfg. Co., formerly of Medina, O., has purchased the plant of the Orrville Brass Foundry, Orrville, O. The company makes nonferrous castings.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Doran Brass Foundry, Seattle, Wash., 75 Horton street, will build a frame addition 66x92 feet.

Krupp Foundry Co., Lansdale, Pa., Quakerstown, Pa., will build a 1-story foundry addition.

Callendar Foundry Co., Guelph, Ont., Canada, is having plans made for a foundry addition.

Collins Foundry Co., Inc., Milford, Mass., has been incorporated for $50,000 by William J. Collins of Milford, and Charles L. Silverstein and Bennie Bean of Framingham, Mass.

H. Poppert & Son Co., Dana building, Fond du Lac, Wis., are building a 1-story foundry, 62x100 feet on Park avenue.

Doran Brass Foundry Co., Seattle, Wash., operating brass and aluminum foundries, is building a plant at 75 Horton street.

Tulsa Stove & Foundry Co., Sand Springs, Okla., has increased its capital from $150,000 to $300,000 and will build additions to its plant.

Phoenix Machine Works, Mobile, Ala., has been incorporated with $30,000 capital. Charles A. Baumhauer, 11 Fernway street is president.

Buckeye Mfg. & Foundry Co., Overpeck, O., has been incorporated with $175,000 capital, by Oscar Eberhardt and Louis P. Hurm.

Federal Metal Bed Co., Hoboken, N. J., has started the erection of a 1-story foundry, 125x136 feet. H. K. Ferguson, Co., Cleveland, O., is general contractor.

Collins Foundry Co., Inc., Milford, Mass., has been incorporated for $50,000, by William J. Collins, of Milford, Charles L. Silverstein and Bennie Bean of Framingham.

Allen-Mitchell Pattern Co., Detroit, Mich., has been incorporated with $10,000 capital to manufacture and deal in castings and machinery by Walter S. Allen, 31 Beresford avenue, and others.

Keese Mfg. Co., Los Angeles, Calif., has started a plant addition in West Belgrace street, Huntington Park, including a foundry, pattern shop and tank shop.

Hubbard Foundry Co., East Chicago, Ind., is making plans for a 1-story addition 110x150 feet. James Thompson, 144th street, is chief engineer.

Louisville Brass Foundry, Inc., Louisville, Ky., has been chartered at $50,000 by C. A. Jackson, James E. Kinnison, Earl F. Shadrach and Russell J. Burt.

Iron Castings Corp., Lansing, Mich., has been chartered by Edward Ver Linden, 814 North Washington avenue, Charles B. Bohn and E. C. Shields.

Rome Radiation Co., Rome, N. Y., has been chartered to manufacture heating devices, capital $500,000, by Thomas B. Hazleton and E. L. Spriggs. A. S. Evans, Rome, is attorney.

Hudson Valley Foundry Supplies Corp., Albany, N. Y., has been formed with $20,000 capital by F. V. Grieseman, W. D. Alexander and E. Oliver.

American Casting Co., Ninth avenue and Louisville & Nashville, Birmingham, Ala., has increased its capitalization from $50,000 to $250,000 and will add to its plant.

Superior Nonferrous Foundry Co., South Bend, Ind., has been incorporated to conduct a general foundry business by Clarence C. Walters, Hope P. Walters and Anna I. E. Walters, all of 601 East Dayton street, South Bend.

Hoosier Foundry Co., Indianapolis, Ind., has been incorporated with $14,000 capital to do a general foundry and machine shop business, by Edward S. Workman, 3649 West Michigan street and others.

Johnson Foundry & Machine Works, Los Angeles, Calif., will build a 3-story brick addition to its plant at 1009 North Main street, a 2-story warehouse and 1-story building at 112 Llewellyn street.

Phoenix Brass Foundry & Machine Works, Mobile, Ala., has been incorporated with $30,000 capital to manufacture iron and brass castings by Charles A. Baumbauer, George W. Marquis and Lovett C. Johnson.

LaGrange Iron Works, LaGrange, Ga., has been formed by L. C. Schaudies, R. J. Higginbotham and has taken over the plant of the J. T. Tice Co. The foundry and machine shop will be remodeled and enlarged.

Flint Malleable Castings Co., Flint, Mich., J. Barringer, manager, will build a 1-story foundry and office building 140 x 380 feet. Wright & Nice, 4238 South Saginaw street, is the engineer.

Standard-Peninsular Brass Works, Detroit, Mich., has been incorporated to manufacture and deal in brass and other metals, capital $500,000, by Fred G. Austin, 1835 David Whitney building, Alfred W. Fussey, and Phillips E. Welton.

Eastern Malleable Iron Co., New Britain, Conn., has started construction of a new plant to house its Vulcan Iron Works division. Lawrence & Coy Construction Co., Hartford, Conn., has the contract. The plant includes a 1-story steel frame building 80x278 feet and one of 3 stories, 80x100 feet.

New Trade Publications

SAND—Sands for industrial purposes are described in a booklet by Algernon Lewin Curtis, Chatteris, England.

TRUCKS—All steel hand trucks manufactured by the Anchor Post Iron Works, New York, are illustrated in a bulletin issued by that company. Details of construction and tables of dimensions and weights are given.

STOKERS—A bulletin by the Combustion Engineering Corp., New York, describes a stoker used in England and on the Continent which is being introduced in this country. A number of features differentiate this stoker from others now in use.

AIR CLASSIFIER—A rotary device to separate various sizes of ground material and classify them after grinding is presented in a catalog by the Hardinge Co., York, Pa. Illustrations are used to clearify the information presented in the text.

POLYPHASE MOTORS—The Century Electric Co., St. Louis, Mo., has issued a bulletin describing details of its squirrel cage induction polyphase motors. Illustrations show all the parts and the assembly, while advantages of these motors are outlined.

NUMBERING MACHINE—Automatic numbering by a device manufactured by the American Numbering Machine Co., Brooklyn, is featured in a recent folder. The dies are hardened tool steel and are designed to give sharp impressions on metal, fiber or wood.

FILTERS—Pressure type water filters as manufactured by the Graver Corp., East Chicago, Ind., are described in the company's recent bulletin. Filtration methods and construction of the filters, with tables of sizes and capacities, make up the subject matter.

CONTROLLERS—A small booklet taking advantage of the winter cold to press home its lesson has been issued by the Monitor Controller Co., Baltimore, suggesting the use of its pressure control station and starter which automatically governs a heating system.

PORTABLE ELECTRIC TOOLS—A wide assortment of portable and stand machines manufactured by the Hisey-Wolf Machine Co., Cincinnati, feature a small page catalog by that company. Drills, reamers, grinders and buffers, with accessories, constitute most of the line.

CONVEYORS—A monorail cable conveyor built by the Conveyors Corp. of America, Chicago, is described in a recent booklet with many illustrations. It may be adapted for transporting coal in power plant or coal yard, and also to other uses with bulk materials.

ELECTRIC RESISTORS—A bulletin describing its type of resistors has been issued by the Monitor Controller Co., Baltimore, Md. Methods of building up a resistor assembly by use of units and connecting devices are shown and ratings and approximate dimensions are given.

CIRCUIT BREAKERS—The General Electric Co., Schenectady, N. Y., has issued a catalog illustrating its oil circuit breakers. Photographs, tables and diagrams embellish the text which describes construction, operation and various characteristics of the devices designed to protect circuits of large capacity.

CLAMSHELL BUCKETS—A variety of uses for clamshell buckets are set forth in a booklet recently published by the Brown Hoisting Machinery Co., Cleveland. Uses suggested are for handling coal, cinders, sand, etc. The work is well illustrated with pictures of installations and with sketches gving capacities, weights, clearances, and spreader bars.

ENGINEERING ACHIEVEMENTS — Engineering progress in 1924 by the Westinghouse Electric & Mfg. Co., Pittsburgh, is related in a catalog propared by H. W. Cope, assistant director of engineering. From radio broadcasting to heavy power machinery, the field of improvement and advance is broad and covered with accomplishment. It is an interesting account of the year's high points.

The FOUNDRY

SELLING THE OUTPUT

The FOUNDRY

What The Industry Needs Today Is Sales Not Production

Fast Passengers Don't Have to STOP, LOOK and LISTEN

GRAY iron foundrymen, I mean the average, are modest. In this line they make the proverbial shrinking violets seem like a minstrel show band. The long haired nuts who refer to themselves, respectfully, as psycho-analysts probably would say that the foundrymen suffers from the inferiority complex. Of course, if the phrase was applied to some honest-to-gosh foundryman of the old school, he probably would swing on the *psycho* out of suspicion and then take his time to look up the meaning of the latter's harsh words.

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PERSONALLY, any foundryman will uphold his end of the argument in a fight or a frolic, but let someone belittle the value of his castings for a given service and that *complex* thing overcomes him. While he may say when among other foundrymen that he is making the best grade of castings to be had, and that he never has a loss or a comeback, when he gets in the presence of a competitor from outside his field he speaks softly, steps lightly and ducks. Let some self-assertive manufacturer of a forging, a stamping or any other sort of a bent tin subterfuge tell a prospective buyer that the foundryman's castings aren't strong enough to be roach proof, that they have a skin like a horned toad, are oversize and warped, and does our foundryman friend rise on his hind legs and fight back? Seldom. Usually, like Will Rogers at the Republican convention last year, he feels that no one dealt him a hand.

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THE curse of this *inferiority* stuff does not stop with individuals. I saw a crowd of able gray-iron foundrymen listen to a distinguished British guest when he leveled some aspersions at American gray iron a few years ago. He politely inferred that the only merit sought in cast iron made in this country was that it should be cut readily by the ordinary pocket knife; probably Woolworth quality. He left the impression that this is true in general of our product.

P. T. Barnum Says/

HOW many have almost reached the goal of their ambition, but losing faith in themselves have relaxed their energies and the golden prize has been lost forever.

Incidentally, he referred to some outstanding examples of the excellence of British castings. Now, this is not injected to rake up the ashes of a past incident with which to kindle any international dispute, but merely to show what I mean by the sweeping previous statements. The significant fact held that no one among the American foundrymen within hearing presented any figures in rebuttal. The suit was lost through default of the defendants.

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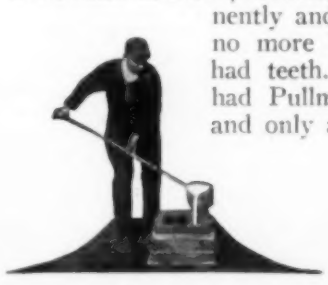
CONSIDER the case of cast-iron columns, only a few years ago so prominently favored, especially for store front construction. Structural steel columns have almost crowded the cast members off the stage at a period when remodeling and renovating has provided a market. Similary, cast iron newel posts, threshold plates and other architectural castings have been shoved aside. Of course, the process has been assisted by lack of standardization, cut-throat competition and a certain measure of stubborn resistance from architects and engineers. All of these factors have contributed, but after all, has not the foundryman been mainly to blame? He has permitted the encroachment of other products, he has failed to educate users to the worth of his product, he has not organized to bring about standardization in sizes, types and quality which would have meant his salvation. He has not had sufficient faith in his product to fight for it and to sell it and keep it sold.

The moral is obvious. Unless foundrymen acquire more faith in their products, and assert this faith prominently and often, they soon will have no more business than the old lady had teeth. You know, she said she had Pullman mouth, lowers all gone and only a few of the uppers left.



Phineas, Jr.